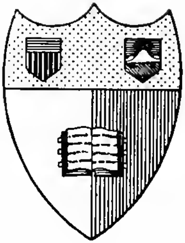
THE WATERBOYS AND THEIR COUSINS

CHARLES DICKENS LEWIS



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THE WATERBOYS
AND THEIR COUSINS

THE WATERBOYS AND THEIR COUSINS

BY

CHARLES D. LEWIS

BEREA COLLEGE, NORMAL SCHOOL

ILLUSTRATED BY

E. H. SUYDAM

PHILADELPHIA & LONDON
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PREFACE

American life to-day needs the calming, steadying influence which comes from an intimate association with and knowledge of nature. Too few can see the groves as God's first temples, or appreciate the depth of meaning in the flower in the crannied wall. We live fast, strained lives and are allowing our children to drop into the same habits at an early age. To assist parents and teachers in their efforts to counteract this influence by establishing right relations between the child and the surrounding facts and forces of nature at a time in life when the imagination holds sway and impersonation is a dominant tendency, these stories have been written.

There is nothing more fascinating and uplifting than the great nature environment of the country child if the eyes are open to see it: but it does not follow as a matter of course that all who live surrounded by fresh breezes, dew and clouds; who work and play in the fresh, clean soil; and who are in touch with the great world of plants; understand, appreciate and enjoy these things.

Our schools teach too much of book and too little of life, and the book is usually of such a nature as to point the child to city life rather than to the possibilities of life in the open country. As a result our "bright children" are selected as the ones who should "become educated," and becoming educated has been in the past, and still continues to be, too largely, a synonym for getting into some occupation away from the soil. The result is that those who should be leaders in the rural communities have been taken into other occupations, leaving our rural neighborhoods without leadership for co-operative buying, production and marketing; the financing and pushing through of public enterprises; the organization and administration of our schools and religious institutions.

To help in overcoming these difficulties the author has endeavored to put into story form some of the more important truths of science, which are closely related to farm life, with the belief that the child who forms intimate relations with nature and learns to find new meanings in old scenes, will be inclined to remain in the country, or be attracted to it, to become an enthusiastic farmer of the new type.

Why not make the water molecule,—a dead scientific fact,—into the "Waterboy" who runs and plays and becomes angry and makes friends, if by so doing reality may be given to the abstract, and yet the contained idea be true to science? Why not allow the "Root Child" and the "Nitrogen Bacteria" to tell their stories, and the "Bean Baby" to laugh, if in this way our boys and girls can be taught at an early age to love and understand the wonderful things about them, and thus be saved from turning for diversion to those things which are lower as a means of gratifying the desire for the new and the strange?

While not facts, these stories are truths, and even though the parents may in some cases think that "lies" are being told to their children, one need not fear that the imaginative child will not understand and appreciate the fictitious element, and at the same time be ready to grasp the truths presented, when they are emphasized by the teacher.

Dickens said, "Stifle the imagination of the child and its ghost will return to haunt you in after life in the form of groveling sensuality;" and in what better way can we let the imagination have full sway than in making alive and intelligent the pure and uplifting things of nature with which God has surrounded the child who is so fortunate as to live in, or within reach of, the open country?

C. D. L.

JUNE, 1918

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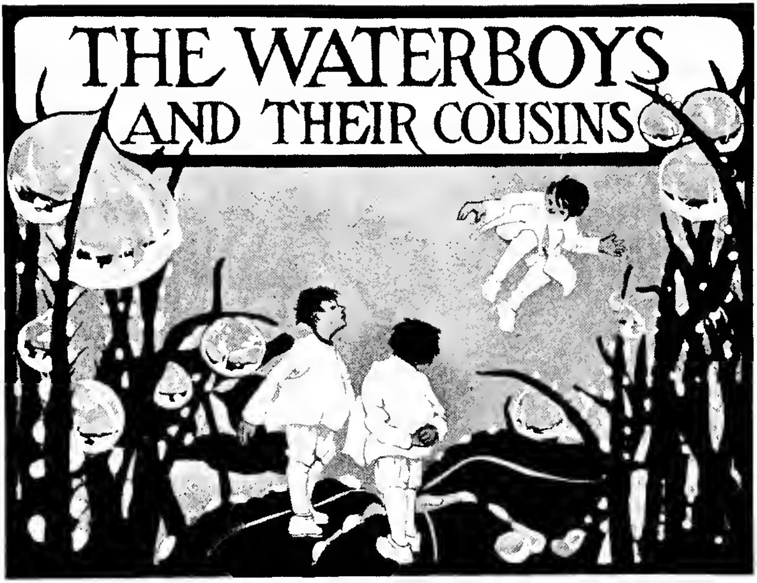


SOON LITTLE CREATURES BEGAN TO DISAPPEAR, SEEMING TO RUN UP THE RAYS OF LIGHT

I

FROM DEWDROP TO RAINDROP

ONE beautiful May morning, while visiting in the fields with my friends, the birds, I made the acquaintance of a most wonderful little people. They had worked for me, entertained me, and in a hundred ways made life pleasant for me, and yet I had never known them. That you may not be so ungrateful as I have been, allow me to introduce to you the Waterboys of earth and sky, and tell you how I came to know them.

The sun was just peeping over the top of a low hill as I stepped from a thicket where I had been hunting a nest. When its beams touched the dewdrops on the grass they seemed more sparkling than usual, so I stooped to look at them.

As my eyes came very close I made a wonderful discovery. It was not a drop of dew at which I was looking, but a wriggling, squirming mass of little fellows with long, slender arms and legs, and round bodies covered with wee jackets. While I looked a sunbeam touched the drop, and the little jackets reflected every color of the rainbow. Soon the queer little creatures began to disappear, seeming to run up the rays of light toward the sun. They went so fast that the drop grew smaller very rapidly, and almost before I knew it, all had gone except one little fellow who stood dancing on the blade of grass where the drop had rested. Fearing that he, too, might fly away and leave me I said to him, "Will you not stop a while, my little friend, and tell me something of yourself and your companions who were with you a moment ago?"

He stopped dancing at once and turned to me with a polite bow:

"With great pleasure, sir. What would you have me tell you?"

"Who you are, where you live, and where your friends have gone," was my reply.

"I shall be pleased to do that, sir," he answered. "We are the Waterboys, and we live almost everywhere. As to my friends, they have run up that sunbeam into the sky to play with the Breezes.

"Father Sun calls us to come up into the sky to play, but we answer him that it is too far for us to jump. Then he stretches down his beams and we run up as you have seen.

"We dance and play with the Breezes and the Sunbeams and are often carried far away. They take us higher and higher until at last we begin to feel cold. Then we crowd close together, lock arms, and dance and whirl very fast to keep warm.

"While we play alone in the sky you cannot see us, but when we form into companies you call us clouds.

"But I must be going, sir, if you will excuse me. The Waterboys have all left the other grass blades, and I will be lost from them if I do not hurry."

With this he jumped to the sunbeam, which by this time had moved from the blade, and before I could say good-by he was out of sight.

I went home, thinking of my new friend and wondering if I should ever see him again; but he soon passed from my mind, as I took the train within an hour for a place many miles away, where I wished to do some more bird study.

Shortly after noon I was again in the fields, and by four o'clock was so tired that I lay down on a grassy bank to rest. As I looked at the great piles of clouds rolling up in the southwest, I thought of my friend of the morning, and wondered if he were there looking down at me.

I suppose that I must have gone to sleep, for the next thing I knew, a loud clap of thunder waked me, and a few big drops of rain splashed upon the grass near-by. I sat up, and very much to my surprise, saw on a grass-blade where a drop had just fallen, my friend the Waterboy, whom I had seen run up the sunbeam into the sky only a few hours before.

"You are surprised to see me, are you not?" he asked with a laugh.

I agreed that I was, and he went on:

"After I left you I played with the Breezes for a long time and they carried me and my companions far away from where you saw me. At last we got so high that we became very cold. This made us join in companies to keep warm, and soon we formed great clouds. More and more of us gathered together until the cloud became larger and thicker. At last many of the Waterboys began to say, 'Let us fall back into the fields and water the little grass blades. They look thirsty, and it is so cold up here.'

"With this, many of the companies crowded closer and forming what you call raindrops, plunged down to the green fields below.

"I did not go with the first ones, for I saw you lying here on the grass, and I wanted to drop right upon you if I could. I asked my friends to wait till I said 'go,' and they did. You see how near I came to striking just where I wanted to. The other Waterboys ran away, but I waited for the thunder to wake you.

"I am going down into the ground now, for playing in the sky makes Waterboys very hungry, so good-by once more."

As he slid down the grass blade, however, he looked back, calling, "You had better run into the house, for there are a great many more Waterboys up there in the clouds, and they will come pouring down in a few minutes. Old Thunder is saying, 'Fall, Waterboys, fall,' and they will soon obey him."

I followed his advice at once, and it was well that I did, for I had scarcely reached the nearest house when great drops of what I know now to be companies of Waterboys clinging close together, came dashing to the ground.

From whence had they all come? I knew that there had not been so many in the morning dew. Later I learned that Father Sun takes them up on his beams from the leaves of green plants, damp earth, creeks, swamps, rivers, and most of all from the great ocean far away.

From whatever place they come, they stay in the sky until they become so cool that they gather together in companies and fall to the earth as rain.

II

THE WATERBOYS WHO RUN DOWN THE HILL

The Waterboys who drove me in from the fields did many interesting things after they reached the ground.

Those who fell upon the ploughed fields crept into the cool, dark openings between the soft grains of soil, and calling to their companions to follow, they were soon out of sight. The first ones who entered did not go very deep, for they were so hungry, and the soil grains smelled so good, that they caught hold of them with arms and legs and ate greedily. You need not wonder at this, for they had been up in the sky so long, playing with the Beams and Breezes, that they were almost starved.

As more and more of their friends came tumbling down from the sky, they covered every soil grain and filled the spaces between. At last they became so crowded that those below began to call to the ones above, "Do not come down here. There is no more room."

The Waterboys were still falling from the clouds, however, and as they came splashing down among their friends they heard this cry from below. But what should they do? They stood still until they formed little pools all about in the low places. Then suddenly they heard their friends who had fallen upon the road near-by calling, "Come, run with us down the hill. It is great fun; but gather your arms full of fine soil so that you may eat as you run."

"COME, RUN WITH US DOWN THE HILL, BUT FIRST GATHER YOUR ARMS FULL OF SOIL SO THAT YOU CAN EAT AS YOU RUN."

This pleased them well, so they joined the stream of hurrying Waterboys, locked arms with them, and went running, jumping and laughing down toward the little creek in the valley below. They did not forget, however, to do as they had been told, and provided themselves with as many fine grains of soil as they could carry. Their loads were so large, in fact, that they all became quite yellow by the time they leaped with a splash into the stream at the bottom of the hill.

Down this they floated, while other armies of Waterboys came pouring from either side to join them on their way to the larger stream farther on. Some of these were friends with whom they had played while in the clouds, but many were strangers whom Father Sun had called into the sky from places far away.

Those that had fallen on the hard, steep hillside came very fast, for they were angry at not being able to enter the soil, and had picked up as much as they could carry of the coarse soil and sand over which they had passed. The ones who had fallen in the meadows and forest, however, came quietly slipping in almost as clear as when they had dropped from the sky. The grass blades and leaves had held them so long that when they did get away they had to move very slowly, and little strength was left with which to carry a load. But soon after they had entered the stream they took a part of the load which their brothers were carrying, so in a little while all looked alike.

They carried their loads quite easily for a time, but when they came to the deep pools where all stood still, they became tired. At length one said, "I am going to drop the coarse, hard grains of sand and earth which I picked up as I ran down the hill. They are so heavy to carry and are not very good to eat, anyway."

As he let these large grains slip from his arms, his companions, who were tired, too, followed his example. So many of them dropped the coarse part of their loads that quite a pile of sand was left at the upper end of the pool, and a thin layer of finer grains was dropped over the entire bottom above which they rested.

After travelling for a long time they came to a river where so many Waterboys had gathered, coming from hillsides and valleys far and near, that they filled the river so full that its banks could not hold them. Some of them spread out over a level cornfield where they became more tired than ever before. Seeing the cornstalks and, thinking that they might be hungry, the little fellows dropped some of the fine soil which they carried, around their roots, and when they were gone the stalks found a layer of rich soil all over the ground. This pleased them well, for it was the very kind of food that they needed to make them grow.

In other places they could run fast as they were crossing the field, and this made them feel so strong that instead of dropping a part of the soil they carried they picked up some over which they passed. As a result, when they had passed on, some of the soft earth had gone, too, and the corn with it.

And so they went down the river, coming at last out into the great, still sea. Here they floated for days and weeks and months. They ate of the soil which they carried until they could eat no more, and finally let the last bit drop to the bottom. Then they were perfectly clear, just as when they came from the clouds; but their bodies were full of the food which they had eaten. Had you tried to drink them, you would have discovered this, for they had a strange salt taste. This was because of the salt and other things which they had eaten on their long journey since they fell from the clouds.

But the Waterboys did not stay always in the ocean. Every day Father Sun stretched his beams down to the water and called, "Come back to the sky and play, little friends. Mother Earth will need you soon to water her plants, and I want you to play with the breezes awhile."

Many wished to go, but they could not do so while their bodies were heavy with the food they had eaten. But Waterboys can do what, to us, seems a very strange thing. They can throw out the food which they have eaten just as a cow can bring up from her stomach food which she has swallowed. So all who wished to fly back into the air gave their food to those who wished to stay. Then they were light enough to run up the beams or to fly off with the breezes. In this way they at last joined the other Waterboys, coming from dew-drop, field and river, in their great sky play-ground, where they stayed until they again fell to Mother Earth.

III

THE WATERBOYS IN THE GROUND

In our last story we followed some of the Waterboys into the ground, but there we left them, in order to go with their companions who ran down the hill to the creek. You remember how they travelled to the sea and were at last called back to the sky by Father Sun. We will now return to those who crept into the ground and find out what happened to them.

Before the rain was over every soil grain was covered with Waterboys, and every tiny space between was filled with them, down as deep as the ground had been loosened by the farmer's plough in the spring. Below that the earth was packed so hard that they had to wriggle and squirm to get through, so they went much more slowly.

All who could cling to the soil grains were very happy, for they could eat as much as they wished, but the ones crowded between them could not get so much as a taste. They crept deeper into the ground as fast as they could, hoping to find a place where they too could get hold of the soil grains, but every one was covered. All that they could do was to beg bites from those who were more fortunate than they. In this way quite a little food was obtained, but still their hunger was not satisfied.

Reaching at last a place deep within the ground, where even the spaces between the grains were full again, they could go no farther.

"Why do you not go on?" asked a Waterboy, who had just come, of one who was below him.

"There is a very close-grained rock down here," was the answer, "into which very few of us can creep. Some are tired of waiting and have started to climb back to the top, but others say that if we wait a little while we can go along the top of the rock and find our way out. I thought that I would try this plan."

"I think that I shall, too," said the Waterboy who had asked the question.

THEY SPLASHED DOWN A LEDGE OF ROCK INTO A ROUND BASIN HOLLOWED OUT OF THE ROCK

After waiting a long time, those near them began to move. They crept slowly with the others, and at last heard the cry from those ahead, "We can see light." This gave them courage, and after a little more pushing and squeezing they tumbled into a stream of water which ran through a channel in the rock. This soon carried them into the light and the fresh air, which made all the Waterboys very happy, so with a skip and a laugh they splashed down a ledge of rock and poured into a round basin which had been hollowed out of the solid stone.

It was a spring under a great Beech tree, and two little boys were standing by it with a water-bucket and dipper. They filled the bucket with the clear, cool Waterboys and carried them up the hill for some thirsty children to drink.

Those who were not put into the bucket ran down the hollow and at last reached the creek along which their friends who did not enter the ground had passed many days before. They carried no earth grains under their arms as the others had, and so they were clear instead of yellow. Each, however, was quite well filled with the food which had been given him by the friends who were clinging to the soil grains which he had passed.

As soon as the Waterboys from the spring reached the creek, those who were there began saying to them, "Take some of our loads. We have more than we want and you have none." So they divided their burdens and all had loads of soil to carry to the sea.

These Waterways went the same way that the others had gone, but there were not so many in the river by the time they reached it, so they did not have to spread out over the fields. They travelled much more slowly and quietly, and each day many of them flew off to the sky. But they always left the soil grains which they carried, and the food that they had eaten, with their friends who were going on to the ocean.

IV

HOW THE WATERBOYS CLIMB BACK TO THE AIR

Having learned what happened to the Waterboys who crept through the rock and out at the spring, let us now go back and learn what became of those who got tired of waiting and started to climb to the top of the ground.

As they looked above them they could see that all the spaces between the soil grains were becoming empty, except for the air which crept into the ground as the Waterboys left room for it. This kept them from climbing into the spaces, so they could go up only as fast as they could find room to get hold of a soil grain above.

At first very few such places were to be found; but the sun having begun to shine upon the ground, many of the Waterboys were flying off into the sky again. This made more room all the time, and as fast as one climbed higher, another from below took his place. In this way they kept climbing, climbing, but it was slow work.

There were many things, too, which hindered them. In some places the farmer had ploughed the ground when it was too wet and the plough had pressed the soil grains in the bottom of the furrow so close together that they could scarcely get through at all. At other places they found clods which bothered them a great deal. These were so hard that they could not get into them, so they had to go around, and of course that took much time. The worst place, however, was where the farmer, as soon after the rain as the top of the soil was dry enough, had gone over the field with a cultivator which had many small shovels, and had broken the top layer into small clods. These lay so loosely together that the Waterboys could not reach from one to the other, so they had to stop. They never would have reached the top in such places had it not been for the Root children who helped them out into the air.

THEY KEPT CLIMBING, CLIMBING, BUT IT WAS SLOW WORK

At one time, when some of the Waterboys were almost at the top, they heard the farmer say to his son, "John, you must hitch to the cultivator at once and go over this field. The water is all flying away into the wind, and we must keep it in the ground for the corn. It may not rain any more for a long time, and if what is in the ground now flies away, we may have no crop."

They climbed as fast as they could, but before they were able to get out, John had come with his cultivator and broken the top of the ground so that not one could reach the air.

This disappointed them greatly, but the Root children began to say, "Do not cry, little Waterboys, just wait a while and we will help you get out."

This made them quite contented and each waited patiently for the time to come when it should be his turn to be helped.

V

THE WATERBOYS IN THE CORN STALK

The Waterboys were very glad to hear the offer of the Root children to help them get out into the air. They were tired of staying in the ground with nothing to do but eat from the soil grains. They longed to get into the air once more where they could play with the sunbeams.

As the tiny, soft Roots crept through the soil whispering, "Come, Waterboys, come," they let go of the soil grains and slipped into the many mouths held open for them.

Passing quickly through the tender tips, they were soon in the larger Roots that do nothing but carry the Waterboys which the tips catch. Here there were many tubes into which they could easily creep. They were very glad to get into these, for they were sure that through them they could quickly reach the air.

Up, up they felt themselves being carried through the corn stalk, and at last they could see light above and below. All the Waterboys were anxious to know just where they were, so in a few minutes one, braver than the other, called to a Plant Worker standing by the tube: "Tell me, please, where we are and how long it will be before we get into the air."

The Worker to whom he spoke answered with a chuckle, "You are in the leaf, and now it is time for you to pay for being brought up."

"How is that?" the Waterboys questioned in great surprise. "We did not know that we were to pay for being brought up. We thought that the Roots were glad to help us."

THE ROOTS CREPT THROUGH THE SOIL WHISPERING, "COME, WATERBOYS, COME"

"So they were," was the reply, "but we must be paid for our part of the business. The Root children could never have sent you up here without our help. Do not be alarmed, though," he continued. "You will not mind paying us what we ask. All we want is the food you bring from the soil."

"Oh, you are very welcome to that," exclaimed the Waterboys, much relieved. "We have no use for it. We would have thrown it away at the top of the ground, anyway, had we gone out that way, for as long as we have it we are too heavy to fly."

"We know all that very well," said the Worker with a laugh, "but we enjoy frightening some of you occasionally. We will not harm you, for we could not live if it were not for the food you bring us."

After the Waterboys had given up their food to the Workers, they slipped through the walls of the tubes along which they were travelling. But they were not yet out in the open air. They were in the halls and chambers of the leaf which stretched out in every direction. In them floated thousands of other Waterboys hunting for a way to escape.

"How shall we get out?" they began to ask each other.

"Go down to the bottom of the leaf," said one of the Workers, "and you will find many doors through which you may pass."

They did this, and soon found the doors, but even then it was not an easy matter to escape. There were crowds of tiny people, smaller than themselves, who were pushing and struggling with all their might to get in, so they had to use all their strength to get by them. These little fellows were the Carbon Dioxide men, of whom I will tell you more later.

All the Waterboys were not so fortunate as the ones about whom I have told you, for many were caught by Workers who wished to make use of them, and carried away as prisoners. But of these, too, I will tell you in another story.

All through the days of summer the Waterboys keep going into the air through the roots, stalks and leaves of the corn. At night they go very slowly, or not at all, because the air outside of the leaf becomes cool, and there is but little room in it for them. When it is hot and dry they go very fast. Sometimes they fly away so fast that the corn stalks have to stop them. They do this by rolling up their leaves so as to close the little mouths in their lower sides. It is very well that so many of the Waterboys do fly off in this way, for the food which they have taken from the ground, besides being of use to the Workers in the plant, becomes food for animals and men as well.

So the Waterboys go from place to place, always busy, always happy, and almost always being helpful to some one.

VI

HOW THE ROOT CHILDREN GET DRINKS

When the leaves on the plants begin to wither, and the corn blades roll up, do you know that they are calling for help? They are crying, "Water, give me water." You do not hear them, but the little Root children down in the ground do, and they work with all their might to find water to keep them and the other parts of the parent plant from suffering.

When boys and girls want water they go to the spring, or draw a bucket, sparkling and cold, from the well. When horses and cattle are thirsty in the field, they run to the creek and stand in it up to their knees and drink as much as they want. When birds begin to choke as they fly through the air they hunt a shady pool and bathe, and wet their little throats. But when plants become thirsty they can do nothing but droop and call for water.

Under the ground, you know, there are many roots. You can see them if you pull a plant from the soft soil, but these larger roots can only carry the water; they cannot gather it from the ground. That must be done by the little Root children. These grow from the larger roots and are ever pushing their tender bodies through the soil, hunting, hunting everywhere for the Waterboys. They wish to send them up to keep the stem and leaves from suffering.

One summer evening I was walking through a cornfield, and, wishing to learn how dry the soil had become, I stooped and raked the upper layer until I came to the cool, damp part below. As I did this I heard a little voice say:

"Oh, I am so tired. I have worked very hard for Mother Stalk to-day. She has drunk so much water, and the Waterboys have not been able to climb up to me as fast as I needed them."

The sound seemed to come from where I had removed the soil, so I dug down very carefully until I caught sight of a tiny root. As I uncovered it, the voice continued, much clearer than before, "Thank you. I can talk more easily now.

"I am one of the Root children. When it is dry and hot, as it has been to-day, I have to work very hard to keep mother from getting thirsty."

"I am very glad to know you," I said in return. "Will you not tell me of your life here in the ground, and of the work which makes you so tired?"

"I shall be glad to," he answered with a weary smile. "You see that I am very small. Perhaps it looks to you as if there was nothing of me but a little, smooth body. But if you could see well enough you would find that there are many very tiny mouths all over me. You have only one mouth with which you must eat, drink, and talk, but I have one like yours, and many others with which I only eat and drink. They are the ones that are scattered over my body. They are so small that I cannot swallow anything larger than a Waterboy, but I can suck them up very fast from the soil grains to which they cling.

"When it rains, the places between the soil grains become full of Waterboys, and then I can get them very easily. They are not good, though, for they have just come from the clouds and have not had time to eat from the soil. They have no taste, and there is no food in them for mother, so they are worth very little indeed.

"When the ground begins to dry, the Waterboys who cannot get hold of the grains of soil go down deep into the earth. The ones that are left cling so closely to the grains that I cannot pull them off. Some, however, are always restless and anxious to get back into the air. I whisper to them, 'Come into my mouths, little Waterboys, and let me send you up to the leaves where you can get out into the air and play with the breezes.'

"When they hear this they let go and slip into my mouths, and other Waterboys from below climb up and take their places.

"If you will look very closely at my body a little way back from my nose, you will be able to see many tiny white 'hairs,' as you may call them. They are not hairs at all, but tiny tubes covered with mouths just like mine. They find cracks and corners about the soil grains, into which I cannot go, and get many Waterboys which are out of my reach.

"The Waterboys that climb up from deep in the ground are very fine for mother, for they have been there so long that they are as full of food as they can be. Some may have been there all winter. There are plenty of them to last her all summer if the farmer cultivates the ground so as not to let them fly away."

"SUCH AN IGNORANT MAN WILL OFTEN HAVE A HANDFUL OF OUR DEAD BODIES HANGING TO HIS PLOUGH"

"You like to have the ground ploughed then, do you?" I asked.

"Yes, if it is done right," was the answer. "But the way some farmers do is terrible. They will take a large double-shovel plough and tear up the soil as deep as it was broken in the spring.

"They do not seem to know that we spread clear across the row before Mother Stalk is half knee-high."

"Such an ignorant man will often have a handful of our dead bodies hanging to his plough when he gets to the end of the row. This, of course, makes Mother Stalk suffer for water, and grow more slowly until she can make new Root children to take the place of the dead ones.

"If the ground were made soft and fine before the seed from which mother came was planted, and after that only stirred on top to kill the weeds and keep the Waterboys from flying away, she would not often get thirsty.

"Nothing makes me so angry, though, as clods. They are so hard that I cannot push into them, and yet I know that they contain good food for me if I could only get at it. The Waterboys cannot get into them well either, so that leaves fewer of them for me to catch.

"I hear mother calling for a drink, now, so I must get to work. She does not need so much water after the sun goes down, but even then she must have some. If you will please draw the soil over me again, I will call the Waterboys to come and let me send them up into the air."

With this he said good-by; and I did as he had asked.

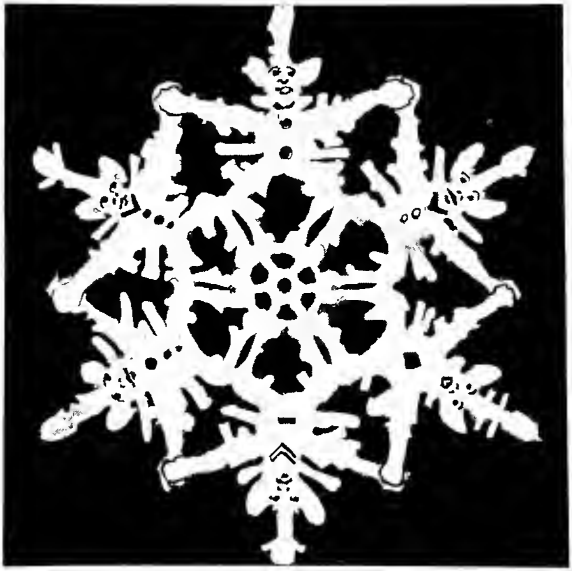
Ever since that time, when I see the blades on a stalk of corn rolling up, I know that for some reason, perhaps because the farmer did not know how to care for his fields and to keep the Waterboys from flying into the air, the Root children were not able to get drinks for Mother Stalk as fast as she needed them.

VII

SOME STRANGE WAYS OF THE WATERBOYS

You have learned in other stories of the Waterboys sparkling in the dewdrop, running up the sunbeams, floating in the clouds, falling as rain, and rushing down the hillsides. You know how they creep through the soil and come to light again as a spring. You have watched them with your imagination as they climbed back to the top of the ground to fly once more in the air, or slip into the mouths of the Root children, and find their way out through the leaves. Let me now tell you a few more of their strange and interesting ways.

The next time you see great white feathers of snow drifting down from the sky, hold out your arm and let a flake light upon your dark sleeve. For a moment you will look at it and wonder how it became so beautiful. The next moment it will lose its shape and whiteness and be nothing but a drop of water. Where did it get its wonderful form, and why did it so quickly lose it?



INSTEAD OF A DROP OF WATER THERE WAS FORMED A SNOW FLAKE

Could you have been high up in the air from which it came, miles above you, perhaps, you might have learned the secret. It was very cold there, so cold that the Waterboys dared not dance alone or trust to keeping warm by forming into companies. Only the little Dancing People of the air could endure such cold, and it was they who saved the Waterboys from death and helped to form the snow flake.

When the Waterboys became so cold that they feared they would really freeze, they began to call loudly, "Help, Air People, help or we die!" As they did this they rushed together, much as they do when they form drops of rain. But before they grasped each other, the tiny Air People answered them by springing in between. They, too, had strong arms, and helped to hold the Waterboys more tightly together than it was possible for them to cling by their own strength. So, instead of a drop of water there was formed a flake of snow. The presence of the Air People changed the appearance of the mass of Waterboys greatly. They were no longer clear, but white. When it became warm the Air People slipped out and flew away, and then the white, solid snow flake became water.

When frost is formed the same thing happens. The Waterboys becoming cold, call upon the Air People to join with them to keep warm, and we find the same beautiful white crystals formed as were seen in the snow-flake.

When water freezes, however, a different method of keeping warm is employed by the Waterboys. Then there are no Air People to call upon, so the Waterboys roll themselves up into balls much as children roll themselves up in bed when it is cold. They lock their arms very tightly together as they do this, so that they hold more firmly than in any other way. That is the reason the ice is so solid. But they occupy more room when rolled up, so that the ice which they form is larger than the water which formed it. That is why we say, "Jack Frost often breaks the glass from which he drinks."

Water flowing over rocks or dripping from the eaves of a house is usually white, almost like snow. That is because the Air People can get in to help the Waterboys keep warm in such places.

When the Waterboys climbed up the soil grains to reach the air they were only following one of their regular habits. They like to climb wherever they may be. Hold a glass of water level with your eyes and you will see that the water is pulling up all around the glass. This is because every Waterboy that can reach the glass starts to climb it. They might climb a long way if it were not for companions who are near them. They catch hold of those that are climbing, hoping to be carried up, too. So many cling together in this way that soon those who have hold of the glass have more than they can lift. Then they must stop.

Put your finger into water and it comes out wet. The Waterboys cling to it and will not let go until they are wiped off, or the warmth of the finger makes them fly away into the air. Touch your wet finger tip to the water and you will see how the Waterboys that have hold of it can pull their companions up.

If you want to see how Waterboys can climb, put a knife blade against the inside of your glass of water some day at dinner. You will see them almost jump up the side of the glass where the knife touches it. In this small space but few others can cling to those who climb, to hold them down. It is in just the same way that the oil in a lamp wick climbs; for the oil, too, is made of tiny creatures like those of the water and air.

Did you ever try to wipe the water from a cold dish? If you did I am sure that you know how hard it is to get it dry. If you could see the cold Waterboys you would know why this is. Each little fellow, when he becomes cool, lies flat on the dish and holds to it with all his strength. He can find rough places on the smoothest surface which his tiny fingers can grasp, so it is hard to get him off as long as he wishes to remain. It is very different with a warm dish, however. On it the Waterboys are dancing and skipping about, so that one stroke of the cloth will remove them.

Have you ever wondered why it is that you stand in a warm place to dry your clothes after you have been out in the rain? It is because the Waterboys cling to the threads when they are cold just as they do to the cold dish. But when they get warm they begin to dance and play, and soon fly off into the air. For the same reason, on wash-day, your mother's clothes dry faster in the sun than in the shade.

Another thing, too, helps the Waterboys to get into the warm air faster than into the cold. The little Air People are dancing everywhere and the Waterboys, when they fly, must keep out of their way. This is easily done when the air is warm, for then the Air People are farther apart than when they are cold, and that makes more room for the Waterboys to slip in among them.

Have you ever seen a needle float upon water? If not you have missed an interesting sight. Bend the points of a wire hair-pin so that you can lay a needle across them, and then let it down very carefully upon the surface of a cup of water. The needle will press the water down slightly but ride as safely as a little boat.

This again is because of the ways of the Waterboys. They do not want the Air People to get in among them, so those on the surface next the air hold more tightly together than any of the others. This makes a sort of a "skin" over the surface of the water which is strong enough to bear the weight of the needle. You can see this same skin when you pour water from the dry mouth of a bottle or from a cup. Watch carefully and you will see that the water is held back until it is piled up on the edge high enough to break the skin which the Waterboys make.

There are many other interesting things about these little neighbors of ours, which I am sure you will find out for yourself.

VIII

THE DANCING PEOPLE

One bright June morning I was bird-hunting along a small stream, up which I had been slowly moving for several hours. Near noon, when the sun began to find a way to reach me even through the trees and underbrush, I sat down on a moss-covered log near the water to rest and to eat a lunch which I carried in my pocket.

Bright colored minnows were playing in the clear water; and from a limb directly above my head a red-eyed vireo was scolding at me. In order that I might better see my ill-natured friend, I lay back against a large mossy limb and rested my feet across another which happened to be at a convenient distance. After a few minutes the vireo must have concluded that such a lazy fellow would not harm his babies, for he flew away to another tree and began to hunt worms for the little mouths that waited for him in a cozy hanging nest near by. At this, I turned so that I could see the water and watch the minnows playing over the gravelly bottom; and, as the sun poured hot upon the stream, I began to think of the wonderful Waterboy friend I had met that other day while bird-hunting. My thoughts must have influenced the Waterboys who were flying off from the surface of the pool, for suddenly one was dancing right before my eyes on the flat surface of a leaf.

As soon as he knew that I saw him, he stopped dancing and bowed to me very politely. I bade him good morning, and asked if he had been playing with the fishes in the stream. He answered that he had, and as he seemed to be waiting for me to continue the conversation I said, "Mr. Waterboy, if you have time to stay a while with me I would like to ask you a question that has been on my mind ever since I first met you, or one of your brothers. Can you do me the favor?"

With a very broad smile and a low bow he assured me that he would be glad to do as I desired; so I asked, "Are there any other little people like you and your brothers, or are Waterboys the only ones of your kind? I have often wondered if there are around me other strange little creatures like you which I cannot see."

My friend looked at me in surprise for a moment before answering and then said, "Any others like us! Well, I should think there are! We are only one family of the Dancing People, and there are many others very much like us. In fact wood, stone, leaves, air, everything, is made of us. We Waterboys are among the smartest of the Dancing People, and some of us have learned to make ourselves appear thousands of times larger than we really are. That is the reason you have been able to see us. We usually change size so rapidly that you cannot see the change, but we can also do it slowly. Just watch me now." I did watch him, very closely, and saw him slowly growing smaller and smaller until he disappeared altogether. Then, after a moment, he reappeared, gradually becoming large again. "There!" he exclaimed, when he became his former size again, "you have seen my trick. I am actually so small that no microscope that you men have ever made can discover me, yet I am larger than most of the Dancing People. It is only when many of us cling together that you can see us."

"Why do you call yourselves the 'Dancing People?' " I asked, as he paused for a moment. "Do they all dance as much as you do?"

"You have hit upon the exact reason," he replied. "I can stop, when I want to, but very few of us are able to do this. I have learned to do it only by long practice, and it is hard on me; that is why I will have to fly away in a short time. I just must dance, and I can't do it well when I am large. All of us dance in the same way. As you have noticed we do not move about, but just move back and forth over the same spot. I dance very much faster when I am small,—faster than you ever saw anything move. We dance slower when we are cold, and faster when we become hot, but no place is ever cold enough to stop us entirely."

"Now Mr. Waterboy," I put in at this point, "I have seen you and your brothers, and have heard you talk, so I can believe in you; but I scarcely see how I can believe all that you are telling me about the others unless you offer some proof. You say I never can see any of your Dancing People, as you call them, but those who know how to become larger; and that Waterboys are the only ones that can change their size, so it looks as if you might have some trouble proving what you have told me."

The Waterboy did not become offended at my doubt, but laughing with even better humor than before, he continued: "You will have to believe in the Dancing People because of what they do, and not from what you can see. I'll first try to convince you that the air is made of my cousins. Take the cup that is hanging at your side, to the pool yonder, hold it upside down, just touching the water, close your hands about it for a minute and see what happens."

SOON A BUBBLE OF AIR PUSHED OUT FROM UNDER THE CUP

I took the small tin cup to which he referred and did as he suggested. "Tip one side up just a little," he called, after a moment, "but be careful not to bring it above the surface of the water." I did this, and soon a bubble of air pushed out from under the edge of the cup, and then another and another. "There, that will do," said my friend. "Come back to your log and tell me what made that air come out from under the cup."

"Why, that is very simple," I answered. "My hands warmed the air and it expanded, so of course there was nothing for it to do but get out."

"'Expanded!' Oh, you men think you have a *reason* for things when you have a *name* for it," he replied, "but you do not have the reason at all. Let me explain! That air is made of Dancing People, just as the water is, except that they are not cold enough to get hold of each other as we do. They are dancing too fast. But like all our people, when they become warmer they dance faster, and as they dance faster, each one must have a little more room; so when your hands warmed them there was not room under the cup for all to dance as fast as the heat made them, and of course there was only one thing to do. Some of them had to get out. Men have learned to cool the air so much that the Airboys get hold of each other just as we do when we are cooled, and you call it liquid air. Perhaps you have seen that."

I thanked him for his explanation and said that I had seen liquid air; as he continued:

"Does iron become larger or smaller when it is heated?" When I answered that it became larger he went on, "And I suppose that you would say that it 'expands,' and think you had explained. Let me tell you about that, too. The iron is made of Dancing People, and they dance faster when heated just as we all do; and as they dance faster they must have more room. This causes the whole mass of them to occupy more space, just as it did the air in the cup, so the piece of iron becomes larger, or 'expands,' as you say."

"Next, you may tell me whether a piece of iron becomes harder or softer, more or less easily bent, when it is heated?"

"Softer, more easily bent, and runs like water when made hot enough," I asserted, thinking by the last statement that I might head off another question.

"Quite right," my friend agreed, "and there you have more evidence that it is made of Dancing People. As the Ironboys become hotter they dance faster; as they dance faster they push farther apart; and as they get farther apart they loosen their hold upon each other. This change in temperature makes the piece of iron first a little larger, then softer and more easily bent, and finally, when heated enough, it will 'run like water,' as you say. It has a right to act like we do, for all Dancing People are cousins, and have family traits. If you could heat the Ironboys hot enough they would let loose their hold upon each other and fly off into the air, just as we Waterboys do when we become hot. Large numbers of them live in the Sun, and there they are so hot that many live in the air, just as we do here. If the Earth were very cold, never above the freezing point, you could think of us as being as solid as the iron."

"Has what I have said made you willing to believe in the Dancing People? If not, I can go on for a long time telling you facts that show they are everywhere about you. As you know, heat softens and cold hardens almost everything, and always because of the queer ways of the Dancing People. In the case of things made by plants and animals this is not true. If you warm a piece of wood it does not become soft and bend like iron, or melt like ice; but when hot enough it begins to burn. Then the Dancing People are destroyed. Oh, this is a wonderful story! I wish I could tell you all about how Dancing People are really made up of other people much smaller than we are; and how things sometimes happen to destroy us by pulling apart the tiny folk of which we are made. I only know a little about it, for such accidents rarely, if ever happen to Waterboys. Some of my cousins are torn to pieces very easily, however, and the strangest thing about it is that when this happens the Little Clinging People of which they are formed are made into Dancing People of different kinds. Some day you may find one of our people who can tell you the story, but I do not know it well enough."

"Now, sir, if you will excuse me, I think I must be going. I have stood still about as long as I can; I simply must become my natural size and dance. But I hope that I have at least helped you toward understanding what a wonderful people we are, and how the whole world depends upon us. All are important, and if you never see me again, or have a chance to talk to another Waterboy, just remember that we are always busy, working as hard as we dance. That without us you could not live, and that we are the friends of every living thing, as well as the big brothers and older cousins of all the world of Dancing People. I will leave you now; but my brothers are in the air about you, in every living thing that you see; within your body, making you able to be alive; and believe that we are the friends of all, the enemy of none. Good-by, sir."

With this, and a low bow, my friend grew smaller and smaller until he vanished from sight. I was greatly pleased to have had this visit with him, and to have this last evidence of his regard; for I knew that it was painful to him to change size so slowly, and that he did it out of regard for me. I did not continue my bird-hunting that day, for I wished to go to my room where I could think quietly of the wonderful world of Dancing People about whom I had just learned.

IX

HOW THE PLANT PEOPLE WERE SAVED FROM STARVING

Long, long ago, before men came to live upon the earth, there was a great famine among the Plants. They lost their green color and became yellow and sickly looking. None grew strong as they once had been, and the children were so weak that they could scarcely push through the ground. In fact many died because they were not able to reach the light.

The Plant people were greatly troubled, and at last it was decided that they should hold a meeting of all the wise ones to see if some way of securing food could not be found. Old King Oak called the meeting, and in the shade made by himself and his children, the Plants gathered around his roots. They came from far and near, for all wished to learn how they might find food for themselves and their babies. King Oak waved his branches above them to command silence and spoke:

"We have a sad cause for meeting together to-day, friends. For ages we have lived, strong and happy, upon the earth. Food in plenty has been provided for us in soil and air. But now all is changed. We can no longer find the food that we need in the soil. We are hungry. Our children are starving. Though I have watched other plants and trees spring up, grow and die about me for hundreds of years, I know not what to do. If any one has knowledge that will help us, let him speak."

For a time all were silent, but at last Mr. Corn, one of the wisest of the Plant people, arose, bowed his tassel to King Oak, and said:

"By long and careful study, O King, I have learned what may be of some help. We eat many kinds of food from the soil. Phosphorus, Potash, Iron and Sulphur, together with other things of less value, come from the rocks which decay about our roots. But one food is of more importance than any of these. It is called Nitrogen. The other foods are still to be found in plenty in the soil. It is for this one alone that we hunger. Yet without it we must die. We cannot make a single cell within our bodies unless our roots send it to us.

"I have also learned that every leaf and branch which falls and rots upon the ground and every animal which dies, leaves the Nitrogen within it for us to eat. But must half of us die that the other half may live? That can never be, yet I have learned no other way."

When he had taken his seat, Mr. Apple, another great one among the Plant people, spoke: "I, too, have been studying this question. I have learned all that my friend, Mr. Corn, has told you, and more. I know where this food, Nitrogen, can be found in greatest abundance. The air which tosses our branches and whispers through our leaves, is largely made of it. Enough is there to last us for ages, yet we cannot eat it. Our Root children who bring us food and water from the soil cannot get hold of it. The little mouths in our leaves which give us Carbon cannot take it in. This, however, I know. When some one learns how we can take this Nitrogen from the air we will have no lack of food."

Many others spoke and various plans were suggested, but none knew more than Mr. Corn and Mr. Apple. At last King Oak dismissed them, to meet again at the end of the month and report what had been learned in the meantime.

X

THE STORY THAT MR. CLOVER TOLD

A MONTH had passed and all the Plants were again gathered around King Oak. Many told how they had tried to learn the secret of eating Nitrogen from the air, but no one had succeeded.

A LITTLE FELLOW WHOM NO ONE EXPECTED TO SPEAK CAME TO THE FRONT

At last, however, a little fellow whom no one expected to speak, came to the front. It was Mr. Clover. The Plant people considered him of small importance, but as no one else seemed to know what to do, they listened to him.

"I know that you do not think me able to learn what such wise plants as Mr. Corn, Mr. Apple and others who have spoken could not find out," he said, humbly, "but I believe I can tell you a story which will interest you if you will listen to me for a few minutes."

"Speak on," said King Oak, "we will gladly hear what you have to say."

"A few days ago," continued Mr. Clover, "while busy about my work, I heard a very small voice speak to me. I looked around, but could see no one. Again I heard the voice say 'Look down here, Mr. Clover.' I looked very carefully, and at last saw the tiniest little fellow upon which my eyes had ever rested.

" 'Who are you, and what would you have?' I asked.

" 'I am one of the Bacteria people,' was the reply. 'I was at the meeting which King Oak called, but no one heard me when I tried to speak. I saw you there, and you did not look so proud as the other plants, so I decided to tell you what I wished to tell them.

" 'The other plants talked a great deal, and I suppose that they really tried hard to learn, but I know more than any of them can ever find out. My people are called the Nitrogen Bacteria, because we know how to eat the Nitrogen from the air. We have known the secret for ages, but we will never, never tell.'

" 'What good will your knowledge do us, then?' I asked."

" 'That is the thing about which I wanted to talk with you,' he returned. 'I like you and your family, so I am going to make you the offer that I would have made to all the Plants had they listened to me.

" 'My people have never had a good home. We have always lived in the soil, but we are so small that we are often washed away by the rain, or dried up and killed by the sun. I have thought much of our troubles, and it seems to me that your people and mine can be of great help to each other. Your roots are large and strong, so that you can hold fast to the ground and send them deep into the earth to find water and food when there is none in reach of such small plants as we are. Because of this I propose that we, the Nitrogen Bacteria family and the Clover family, form a partnership. My plan is as follows: If you and your people will allow us to make our homes upon your roots, we will make great cities there where millions of us will live and die. You will give us shelter and water, and in return we will take Nitrogen from the air, mix it with Oxygen so that you can eat it, and give you as much as you want. We will not grow on the roots of other plants, and you will not refuse to give us the water and home that we need. We demand but one thing. You must not ask us to go where the soil is sour. We cannot live in such a place, and if you ask us to go there we will refuse.' "

"This seemed to me to be a good offer, so I asked him to call his people together and I called mine. We talked for a long time, and at last decided to form the partnership which he had proposed.

"The Bacteria people are already building their cities upon our roots. It gives us some pain, but even now I can feel the strength coming back to me because of the food which they are giving me from the air. My dark green color, too, you can doubtless see is returning."

"That will be very fine for you and your children," put in Mr. Corn, at this point, "but what good will it do me and mine? I suppose that you will be very happy with your plenty of food watching us grow weaker and finally die."

"Yes, and what good will it do any of us," cried all the company together.

The plants were very angry at Mr. Clover, and would have driven him away, or perhaps killed him, had he not cried:

"A very great good, my friends. When we die our bodies will be full of nitrogen which the Bacteria have given us from the air, and it will all be yours. Only what we give to our babies will be kept from you. Give us a chance and we will fill the soil full of the food for which you are starving."

"That is true," said King Oak. "Mr. Clover has done a great good for the plant world by the partnership which he has formed with the Nitrogen Bacteria. Had we not been too proud to listen to our humble kinspeople, we too might have been fed from the air by means of these cities upon our roots. But now it is too late. We must be satisfied to wait until the little people and the Clover family can give us what we need."

"From this time on Mr. Clover shall be one of the greatest and most honorable of all the plants, and all his family shall share his honor with him. The Nitrogen Bacteria family, too, though such tiny folk, shall be counted very great, for it is they who will save us from starving."

At this all the Plants, seeing where they were wrong, shouted, "Three cheers for Mr. Clover and the little Bacteria who can eat the Nitrogen from the air."

So the Plants have been fed ever since by the Nitrogen Bacteria who eat the Nitrogen from the air while growing upon the roots of the Clover family.

ALREADY THE BACTERIA ARE MAKING CITIES UPON MY ROOTS

XI

MORE ABOUT MR. CLOVER AND HIS PEOPLE

From the time that I first learned how Mr. Clover and the Nitrogen Bacteria saved the plants from starving, I was anxious to hear more of the matter from Mr. Clover himself.

With this in mind I went into a clover field one evening in June, hoping that I might find out what I wished to know.

If you wish to get acquainted with the Plant people, go out among them at that time, for then they are most willing to talk to those who really love them.

I lay down where clover stood thick and tall, and when all was quiet whispered, "Tell me of your people, Mr. Clover, and of how they and the Nitrogen Bacteria work together to make food from the Nitrogen which is in the air."

When he answered me I was not surprised, for I am out with the plants so much that they know me well, and often talk to me. And this is the story he told:

"You want to know about my people, do you? Well, we are a very large family. There were only a few of us long ago when the first Clover took the Bacteria people to grow upon his roots, but since then we have had more food than any other family of plants, so we have all done well.

"First, there are my closest kin, the other Clovers. They are my first cousins, and I am sure that you know many of them. There is White Clover, the little fellow who grows everywhere, and from whom the bees get so much honey; Crimson, the handsomest member of our family, whose seed has to be sown every year; our Dutch cousin Alsike; Alfalfa, the big fellow who lives out West, and would live a great many other places if people knew how to take care of him; Japan, our little cousin from Asia who has spread all over this country in just a few years, and can now be found almost anywhere that nothing else will grow; and others which you will not see or hear of so often.

"Then there are the Garden Beans and Peas; the Vetches, wild and tame, which you may not know so well; the Cow Peas; the Soy Bean, which was brought over from China a few years ago; and the Velvet Bean, our Giant cousin who came from India and grows so well in the South.

"Besides all these there are the Locust trees, the largest members of our family; Wild Peas; Trefoils or 'stick tights' as some people call them, that hang their babies upon your clothes in the autumn as you go through the fields; and so many others that it would take me a long time even to name them. You can tell almost any of us, however, by our flowers. Most of them are something like the flower of the pea, or like mine which you can see hanging very near you.

"Do the Nitrogen Bacteria live on the roots of all these?" I asked.

"Yes," was the reply, "but not the same kind on all. There are different kinds of the Nitrogen Bacteria, you know, just as there are different kinds of the Clovers. Some grow on the roots of certain members of my family, and other kinds upon others. For example, the kind that lives on my roots will not live upon the roots of Vetches or Soy Beans. When men take these plants from one place to another where they have never grown before, they will not do well until their kind of Bacteria is taken too."

I FOUND MANY LITTLE OBLONG BUNCHES GROWING UPON THE ROOTS

"But how can men get such tiny plants as the Nitrogen Bacteria and take them from place to place?" I inquired.

"I do not know how they do it," he answered, "but I know they get bottles of the Bacteria somewhere and put them on the seed before they sow them. Then when they start to grow the Bacteria get upon the roots and make food for them. Or sometimes a farmer gets soil from a field where there are Bacteria and scatters it upon one where there are none. In the field across the road where you see the Vetch growing so large now, it could scarcely grow at all last year because there were no Bacteria in the soil to live upon its roots and feed it Nitrogen. But last spring the farmer hauled a wagon load of soil from a field where Vetch had grown and spread it upon this one. Now you see how well it is doing. It is because the Nitrogen Bacteria are on its roots and get Nitrogen for it out of the air."

"Can you tell me how I can get to see some of these 'Bacteria cities'?" I asked.

"Certainly," he replied. "You can see those which grow upon my roots if you like. Dig carefully down near me until you find a root, and you will see them."

I did as he suggested and found many little oblong knot-like bunches the shape of a grain of wheat and half as large, growing upon the roots.

"Those are the Bacteria cities," he said. "In them live millions of the Nitrogen Bacteria. They are all the time taking the Nitrogen from the air that is in the soil and mixing it with Oxygen which also comes from the air. This they put with water which I give them. Then it is fit for my roots to take up and send into my body as food. In this way I get all the Nitrogen that I can use."

"By getting your food from the air in this way," I remarked, "I suppose that you can grow any place whether the soil is rich or poor."

"Oh no," he answered. "We could not grow here a few years ago. The soil was sour, and the Bacteria could not grow in it. But a man who knew what to do bought the farm. He put many loads of ground limestone on each acre, and this destroyed the sourness so that the Bacteria could grow. Since then we have been able to grow well, and give him fine crops.

"Besides the great loads of hay which he has taken from the field, we have left much Nitrogen in the ground so that he has raised large crops of corn and wheat. It paid him well to know what to do to help us. You can see across the road what fine corn he raises. Before he fixed the soil, by putting lime into it, so that the Bacteria could grow upon our roots, he scarcely raised anything. Of course he has bought some Phosphorus for us to eat, but it did not cost him much.

"To-morrow he will cut us for hay. That kills our tops, but we like it just the same. We know that in that way we will make his cattle grow, and his horses become strong, and his children happier.

"The thing we enjoy most, however, is to be ploughed under the cool ground to make food for other plants. It kills us, but that does not matter, for we would soon die anyway, and our work in the world is to give food to other plants. Then we know that men save our babies or turn them under with us so that next year they will grow into more fields of clover, better, we always hope, than we have been."

It was almost dark by this time, and the leaves of Mr. Clover were becoming wet with dew. I bade him good-night, and went home, glad to know how well he and his people enjoy their work of making food for the good of other plants and animals, as well as for human beings.

XII

TOMMY'S LITTLE FRIENDS

Tommy was like many other little boys of twelve whom I have known—good, kind-hearted, obedient to his parents, and in many ways what a little boy should be. But in one particular, he was not what his father and mother wished him to be. It is too bad to have to say it, but Tommy did not like to work. Of course, he liked to drive the team or feed the cattle, but when it came to thinning corn or hoeing in the garden, he did not see any pleasure in that.

But during the summer that I first met Tommy he learned to know the Little People of the Soil, and after that his life was different. He became happy whenever he was working in the soil and among the plants. Let us tell you what he learned and how he learned it!

One July day he was in the garden with his hoe, working very slowly and talking to himself, as boys sometimes do when alone.

"Well, Mr. Bean, I'm tired cutting the weeds from around you. I am going to lie down by those currant bushes and rest awhile. If you can't fight those weeds a little longer, you can just die. I don't like beans very well anyway."

With this he lay flat on the ground in the shade and dug his toes into the soft cool earth.

He had been there only a moment when a little voice from the ground said, "You do not like to cut the weeds from around the Bean, then. I should think you would, for that makes it grow better, and it is fine to see things grow. That is the greatest pleasure that my people get out of life. We work all the time to give other plants food so that we may see them become tall and strong."

"WHO ARE YOUR PEOPLE, AND WHO ARE YOU?"

Tommy looked down in the direction from which the voice came, and at last caught sight of a tiny little fellow bowing and smiling at him from among the soil grains.

"Who are your people and who are you?" he asked, in a voice full of interest and surprise, for he had never seen so queer a little fellow before.

"I am one of the Bacteria People," was the reply. "But you need not be afraid of me," he quickly added, for he saw that Tommy looked frightened when he mentioned his name.

"My people live in the soil and do every one good. We never do harm, as some of my distant relatives do who live in the bodies of other creatures."

Tommy was glad to hear this, for his mother had often told him how Bacteria get into people's bodies and make them sick, so he said, "You are so little that I don't see how you could do any good. What can you do, and how do you do it? Tell me about your 'people' as you call them."

The little fellow sat down on the grass blade that lay near him and began: "You think me small, do you? Well, if you could have seen me a few minutes ago, you would not think me small now. I am thousands of times larger than I was. You could never have seen me had I not been given the power to grow very much larger for a little while, so that I could talk to you. I thought that perhaps you would not dislike working in the soil so much if you once learned about the Little People of the Soil, and what they do.

"In the earth all about you there are untold millions of my people. A lump no larger than your little finger tip contains many, many thousands, could you only see them.

"As to our work, do you remember the loads of manure and the weeds that your father ploughed under in this garden early in the spring? You thought that they would make the crops grow, did you not? You were wrong. Without the work that my fellows and I do, all the manure would have been useless. The food for the plants would have been there, but not in a condition in which the Root children could take it into their mouths and send it through the plants. With it all about them, they would go hungry if we had not worked it over so that they could use it.

"We do not work for nothing, for we get all our food from dead plants and animals, but we take the part which plants that grow from the soil could not use.

"Some of my cousins work first upon these dead substances, taking out what they want for food, and then my people take what is left and get what they want out of it. When we get done with it, it is ready for the green plants to eat. It is what your father calls 'well rotted'. Not until it is in this condition can manure or any plant or animal matter that is ploughed under the soil, be used as food by the plants which grow from the soil."

By this time Tommy's eyes were very wide open with wonder, and he exclaimed, "Well, well! Who would ever have thought of so many little people being at work in the soil all the time? So I am not alone while I am hoeing in the garden. I must run and tell mother about you."

As he stopped and looked down again at his new friend, the little 'man,' as he called him, went on, "The work of which I told you is not all that we do. Every leaf that falls, every living creature that dies, would remain just as it was when death came, were it not for my people. And that would mean that more and more of the food for plants would become locked up in their bodies until at last there would be none left for others to grow upon, and everything would die. And this is still not all the good which my people do.

"I am sure that you have heard how the plants came near starving ages ago for lack of food called Nitrogen, and how the Clover people saved them by allowing the Nitrogen Bacteria to grow upon their roots. Well, in the soil there are still millions and millions of these tiny people who have never formed the habit of growing on the roots of the Clover people. They eat Nitrogen from the air all the time, and throw off into the soil where other plants can get it much that they have prepared for their own food and do not need.

"When you stir the ground with your hoe or plough, you let the air into these Bacteria, and make it possible for them to work.

"I might tell you ever so many other good things that we Bacteria people do, and which most people never heard of, but I am afraid that you would forget all if I told you too much at one time. Some other time I will tell you more, or you can learn in other ways when you get older.

"I must get small again now, or some bird may come around and eat me, thinking I am only an insect of some kind."

The little voice ceased and the tiny body seemed to creep in among the soil grains. Tommy ran to the house, but not to ask if it was time for him to quit, as he so often did. He went straight to his mother to tell her of his new friend.

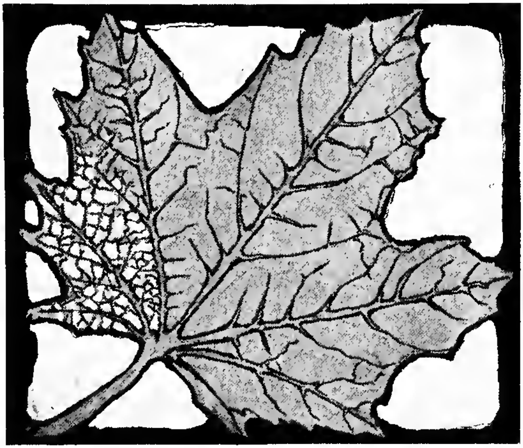
She could tell him very little about them, but when he went to school the next Monday, the teacher told him that all he had learned from the little man of the soil was true.

From that day on, Tommy had a new interest in the farm. He was never alone. Nothing could make him forget the Little People of the Soil, and how they were ever working for his good by 'rotting' plant and animal matter, and in that way were giving back to the soil the food that was in them.

XIII

THE STORY OF THE GREENLEAF MEN

As I sat reading my paper by the table one day after dinner my little boy asked me for a bite of sugar. This was not a strange thing for a small boy to do, but it resulted in my telling him a story which seemed to interest him very much, so I will repeat it to you:



"YOU CAN SEE THE FINE BRANCHES WHICH RUN FROM THESE RIBS TO EVERY PART OF THE LEAF"

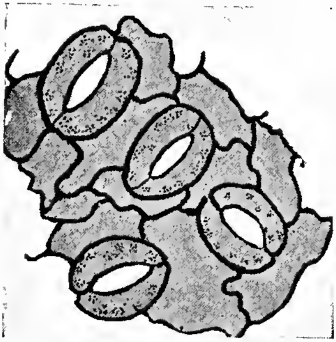
"You want a bite of sugar, do you?" I said. "Well, too much sugar is not good for little folks, so if you like, I will tell you a story of how sugar is made, instead of giving it to you."

Of course he wanted the story, so I went on:

"Will you please run out and get me a green leaf?"

He was soon back upon my knee with a maple leaf in his hand. I held it between him and the window.

"Do you see those five branches which run out through the leaf from the stem? We call them the ribs of the leaf, for they hold the thin part out in the air and sunshine. They also do something even more important than this, for they contain many tiny tubes which come up through the stem from the roots and bring water to the air. You remember, I am sure, the story of how the Root children take the Waterboys from the soil and send them up through the stem and leaves to play with the breezes.


"LITTLE OPENINGS OR DOORS TO THE LEAF"

"You can see also the fine branches which run from these ribs to every part of the leaf. These are called veins, because they are much like the veins in our bodies.

"Now if you could look at the under side of the leaf with my large microscope you would see many tiny openings or 'mouths.' They are so small and close together that the tip of your finger would cover thousands of them. Put the palms of your hands together and then cup them so that only the finger tips and wrists touch. The opening between them is shaped like these little openings or doors of the leaf, as we might call them.

"If we could make yourself small enough to creep into one of these little doors, you would be able to travel all through the lower part of the leaf. There are tiny halls leading everywhere from them. Along these are the cell rooms in which the little Workers of the leaf live and have their shops.

"Look next at the top and bottom of the leaf. Which is the darker green? The upper side, you say. Yes, and it is because the Greenleaf Men are there in the greatest number.

"I have not told you about them, though, have I?

"Well, they are wonderful little fellows. They make their homes in the leaves, and in the bark of young stems, and do a very wonderful work. If it were not for them no animal, and not even men, could live.

"They live in the cells of the leaf, and every one has a very small machine which Greenleaf Men alone know how to make and to run. And how do you suppose they turn their 'mills' as we may call these tiny machines? They do not turn them with their own hands. Oh, no, the Greenleaf Men are much too smart for that. They just set them in the light which creeps down into the leaf, and it makes the little wheel whirl around from the first light of morning until darkness at night. They never have to stop to mend them from the time the leaves push out of the buds in the spring until Jack Frost brings their work to an end in the autumn and the leaves fly away to dance with the October breezes.

"But you have watched the old miller down by the creek, grinding corn on his mill, and you know that he would get no meal from it if he did not put corn into it. The little millers of the leaf, too, must put something into their mills. All day long they stand by them and reach out with one hand into the veins of the leaf through which the water from the roots is passing and catch Waterboys and toss them into the hopper. With the other hand they catch the tiny pieces of gas called Carbon Dioxide, which float in the halls of the leaf, and throw them in with the Waterboys.

"Carbon Dioxide is a very large name for a little boy to understand, but you should know something about it. It is something that you throw out of your body with every breath you take; and the wood and coal which we burn make a great amount of it which flies off up the chimney.

"And what do you suppose the mill makes out of the Waterboys and the gas which the miller puts into it? If you could watch it as you can the mill that grinds the corn, you would find that a little stream of starch comes from the side of the mill. Mr. Greenleaf catches this in a bag which holds just as much as his mill makes in one day.

"One thing more I must not forget, and neither must you. When the mill tears the Carbon Dioxide to pieces there is a gas left over which pours out of a spout into the halls of the leaf, and finally flies out through the doors into the air. This gas is called Oxygen, and it is the part of the air which we must have to breathe.

"In this way the Greenleaf men use the poisonous Carbon Dioxide gas which would harm us, and give back to the air the Oxygen which we must have in order to live.

"Besides doing this, the little millers are the only people in the world who can make starch, and before I finish my story you will understand how important it is to us.

"THE LITTLE MILLERS OF THE LEAF MUST PUT SOMETHING INTO THEIR MILLS"

"But I have not yet told you how the sugar is made, have I? It is time for me to go to my work, so at another time I will finish my story, and not tell only how the starch is turned into sugar, but also how many other wonderful things are made by other little workers who live in the plant."

XIV

THE LITTLE PLANT WORKERS

The evening after I had told the story of the Greenleaf Men to my boy, he pulled his chair up beside mine and said, "Now papa, I am ready for the rest of the story of how the Greenleaf Men make sugar."

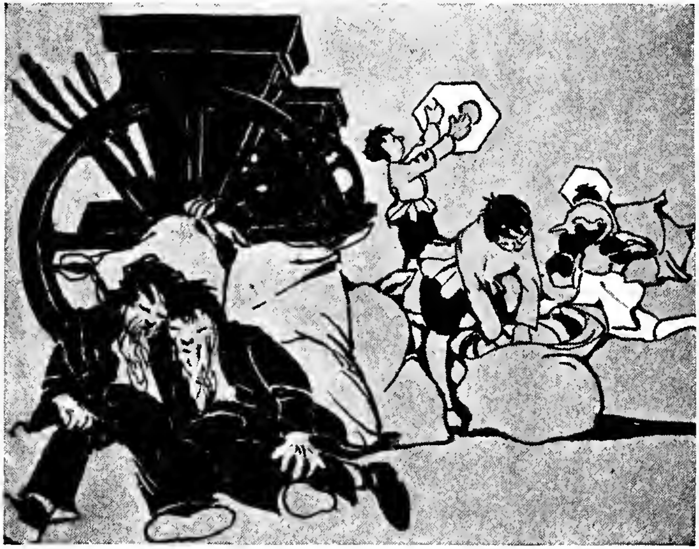
Knowing how hard it was to put him off, I began:

"You remember that the Greenleaf Men worked as long as there was light to run their mills. When darkness came they were very tired, but each one had filled the bag, into which he put his starch, as full as it could be. They gave no thought as to what should become of it, for they knew that before morning other hands would take care of it.

"The sun had scarcely set before every little Greenleaf Man was sound asleep beside his mill; but the cells were not quiet. Before the little millers had begun their night's rest, the tiny hand workers who had been tucked away in the corners of each cell asleep all day, waked and became busy.

"'To work, boys, to work!' they cried to each other. 'Every bag must be emptied before the light wakes our Greenleaf brothers.'

"And how their hands did fly! They would take up two grains of starch with one hand and reach out and grab a passing Waterboy with the other. Poor Waterboy! They slapped him and the grains of starch together, rolled them, patted them, twisted them, pulled them, and at last tossed the ball into which they were made out of one of the little holes in the side of the cell. Here the Waterboy servants caught them and carried them away. But you would never have guessed that the ball was made of starch and a Waterboy. They had been so rolled and jammed together that no trace of either could be recognized.



"EVERY GREENLEAF MAN WAS SOUND ASLEEP BESIDE HIS MILL"

"What do you think the little ball was? It was a tiny particle of SUGAR. Yes, that is the way that the sugar which you eat is made. Two grains of starch and one Waterboy in the cunning hands of a leaf worker for a moment and you have it. All the sugar which my boy eats is made in just that way.*

"All through the night these workers were busy, so that when morning came there was not a grain of starch left in the leaves which had been so full of them a few hours before. All had been changed to sugar and sent to other parts of the plant.

"When the east became red, and the birds began to sing, the Greenleaf Men waked and made ready for the day's work. But before they had opened their eyes every little night worker had slipped away into his corner and gone fast asleep.

"The little fellows who made the sugar were not the only workers in the leaf. All through the stem and even in the roots there were thousands of others as busy as they. Some took the sugar grains which the others had made and thrown into the stream of Waterboy servants passing through the leaf, and worked them over into tiny drops of oil. These were taken to where the seeds were being formed and stored away to be eaten by the baby plant when it awakes in the spring.

"You know how oily the peanut butter is which mamma puts on your bread. All the oil in it was made by the little leaf workers from sugar, and the sugar was made from the starch which came from the mills of the Greenleaf Men.

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* The workers in most leaves put one starch grain and one Waterboy together to make a grain of sugar, but it is not so sweet as that made by using two starch grains and one Waterboy. Only the workers in the sugar cane, sugar beet, sugar maple, and a few other plants, however, know how to do this.

"The most skilful of all the workers except the Greenleaf Men, are the ones who mix starch with the food which the Waterboys bring from the ground.

"You remember how the Waterboys who flew off into the air, after coming up through the roots and stems of the plant gave up all the food that they had eaten while in the ground. Some food was given to the plant workers along the way, while the remainder went to the Waterboys who stayed in the plant for a time to be their servants. What the Waterboy servants took they carried all through the plant, giving to each worker the thing which he needed.

"The workers take these things which the Waterboys have brought from the ground and put them with starch to make many different things. Some make wood and build it into the walls of cells to make them strong. Others make long strings through the bark to make it tough, while still others make the corky layers on the outside of stems and leaves which keep the Waterboys from flying away without going through the leaf doors.

"The best food which the Waterboys bring from the ground, however, the Nitrogen, is taken by the most cunning of the workers. They put it with starch to make food for themselves and for all the plant workers, without which none of them could live. This we call protein. Much of it is stored in the seeds as food for the body plant wrapped up in each one.

From the seeds, such as wheat, oats, corn, peas and beans, we get it as food without which we could not live.

"The queerest little worker, though, I have left to tell you about last. You know that potatoes grow under the ground where the Greenleaf Men cannot run their mills, and yet they have a great amount of starch in them. All of it, of course, is made by the Greenleaf Men in the leaves, and turned into sugar by the leaf workers before it is sent down the stem. It has to be made into sugar, for the starch grains will not go through the tiny openings in the cell walls.

"Well, when the Waterboys carry the sugar into the potato there are great numbers of these workers waiting for it. Each one takes a sugar grain and begins to pull and twist it. At last what do you think happens? The Waterboy which had been worked up with the starch comes out and the starch is left just as it was when the Greenleaf Men took it from their mills. The Waterboy is turned loose to go where he pleases, and the starch grain is packed away in a cell where it stays until my boy, or some other boy, eats it.

"Now I have told you much more than about how sugar is made. Are not the Greenleaf Men, and the other workers of the plant, wonderful little fellows?

"I hope you will never forget this story, and will remember that sometimes it is better to learn about things than to eat them."

XV

PLANT STORE-HOUSES

In the stories of the Greenleaf Men and of the little plant workers, you learned how starch is made, and how from it the many things, which the plants must have to make them live and grow, are formed by the cunning workers who are too tiny for us to see. Have you ever wondered what becomes of all the starch and other things which are made during the summers when every one of the workers is so busy? I suspect that you have, so I will tell you about the store-houses where that which is not needed for building roots, stems and leaves is put away for future use.

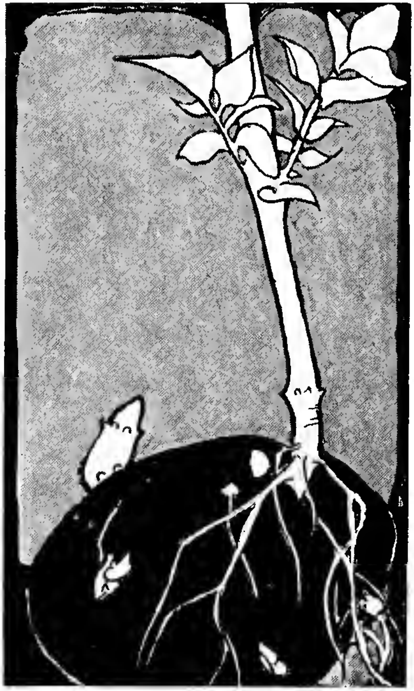
As you already know, seeds get a large part of it. Wheat, rye, oats, corn, and rice have large amounts of pure starch in them. All have some protein, which, you remember, is made by joining starch with Nitrogen and other things taken from the soil. Corn has quite a little oil in it, while cotton seed and nuts have larger amounts in them. Beans and peas are richer in protein than any other seeds, for they get for use in making it plenty of Nitrogen from the Bacteria growing upon their roots.

Much of the starch, however, is not stored in seeds. The bark of trees is often full of it, a fact that the rabbits know well, for they are glad to gnaw it from apple trees for food in the winter. Buds contain it, stored there for the baby leaves which start their growth early in the spring. Squirrels have learned this secret, for they are very fond of the swelling buds of spring, after the workers within have begun to turn the starch into sugar for the use of the growing leaves.

Potatoes, however, are the store-houses which we see more frequently than any others. You may never have guessed it, but a potato is not a root, although it grows in the ground. It is really a stem, and is only growing under the ground to escape from the frost and from being eaten by animals. Roots never grow from a potato, and if you will look very carefully at the "eye" of one, you will find that it is a bud. You may even find the scar where a leaf tried to grow, but became discouraged and soon died because it could get no light. Let a potato become uncovered, so that the light can reach it, and see how quickly it will turn green. It can make Greenleaf Men just as well as a stem which grows up into the light and air if given a chance.

People who do not see things clearly often believe that when a piece of potato sprouts, roots grow from it, but that is not the case. The roots come from the stem which grows from the "eye" and not from the potato itself.

Many other plants store food in stems which grow in the ground in order that they may begin to grow very early in the spring. The lily and the iris are two which you know very well. Dig up some of their fleshy "roots" as you would doubtless call them, and you will find little brown scales upon them. These show that the parts upon which they grow are not roots. They are discouraged leaves which have died for want of light, like those which started beneath the potato "eye."



THE ROOTS COME FROM THE STEM WHICH GROWS FROM THE "EYE"

The great gnarled "roots" of the green brier and saw brier, too, are stems, in spite of the fact that they are buried so far below the surface. The brown scales, and the buds from which stems sprout, tell the story of what this part of the plant is.

There is no storehouse more interesting than that made from leaves. Have you ever noticed that a cabbage head is really nothing but a short stem surrounded by a great mass of leaves closely wrapped about it? They are curled and crumpled up, but if you will pull them off one by one, or split the head through the center so that you can see how it is made, you will see that they are leaves. You will find buds along the stem, too, just above each leaf, arranged in the same way as in an ordinary stem. At the top is a bud which will grow into a long stalk in the spring and produce flowers and seed.

An onion is also a leaf store-house. Yes, you may say, a storehouse for bad smells and burning juice. True, but for food, too, to feed the top which will grow up early in the spring of the second year and produce seed. The stem of the onion, unlike that of the cabbage is very short, just a little button to which the leaves are attached. You can see it when you split an onion down through the center. Tulips, hyacinths, and many other plants form these leaf store-houses like the onion. We call these bulbs.

The Jack-in-the-pulpit, or Indian turnip, makes a little store-room each autumn, from which in the spring the new plant grows. If you have never tasted one of these, I would advise you not to do so, for the least touch of the tongue to the little fleshy ball will make you think for half an hour that your tongue is on fire. This is a clever trick, for the mother plant knows that her bud-baby will not often be harmed or its food eaten by any wild animal.

Roots are also much used for storing food. You have eaten sweet potatoes, I am sure, and perhaps you have also dug them. They are real roots, as is shown by their tapering into a small string at the lower end, and having branches. Turnips, beets, carrots and parsnips, too, are root store-houses in which starch, protein in small quantities, and much sugar

—in the case of the sugar beet—is put away for use in the early spring when the seed-bearing top starts to grow. Dandelions and many other early plants also have fleshy roots or stems in the ground which contain food for the early spring growth.

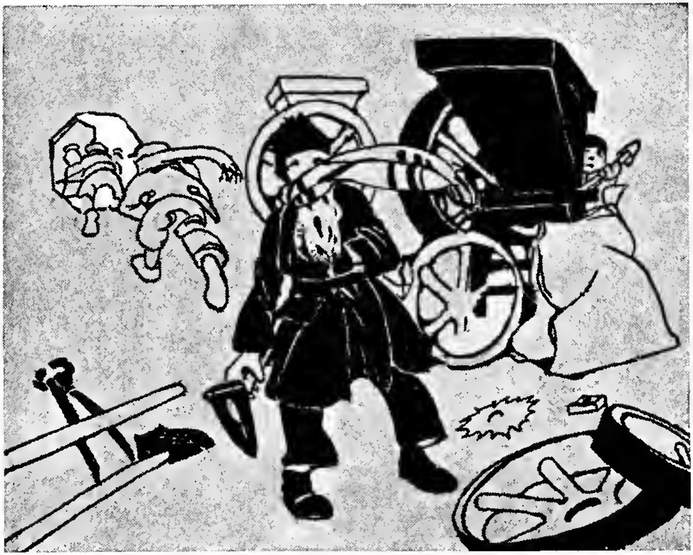
While seeds, fruits, under-ground stems, and fleshy roots are all of great use to man, who has not only learned to use them for food, but has greatly improved them by cultivation, we must remember that the plants make them for the benefit of their own children, or themselves. We cannot make a single new form or feature. We only change to suit our needs the features of plant life which Nature has perfected for the good of the plants themselves.

XVI

THE GREENLEAF MEN AND JACK FROST

In two previous stories you have learned of the wonderful little Greenleaf Men, and their fellow workers. You shall now hear what becomes of these interesting tiny people of the leaves when frost comes in the autumn, and leaves grow bright and fall to the ground.

All through the summer the plant workers are as busy as any hive of bees, so that by the time the autumn days come, their work is about done. Much wood has been added to the trees; food for the next spring has been stored in bark, roots and buds; seeds have been formed, and everything is ready for winter. Many plants die when they have formed their seeds, but others do not fear winter with its ice and snow. They prepare themselves for their long sleep and welcome it when it comes, as tired boys and girls welcome the night.



"BEFORE NIGHT YOU MUST HAVE YOUR MILLS TORN DOWN"

If you could make yourself small enough to creep into one of the little leaf-mouths and travel through the leaf, just after the first light frost, you would find all the workers busier than they had been at any time during the year.

Upon such an occasion you would find that for once in their lives the Greenleaf Men were not wakened by the light creeping into their cell-rooms. The night workers did not wait for this, but called to them when the first gray of morning appeared, "Up, Greenleaf Men! Up, and to work at once, for the frost has been here, and before night you must have your mills torn down, and be moved into winter quarters."

The Greenleaf Men understand this call very well. They had talked of its coming for weeks, and each day some of them, less brave than the others, had been doing what all were now told to do. So many leaves scattered over the trees had begun to tell by their changing color that the days of the painted leaves were near at hand.

The eyes of the Greenleaf Men were scarcely open before they had begun to tear their mills to pieces. All were still in good condition, but the time of their usefulness had passed. They not only took their mills to pieces, and left the parts which were most worn lying about the cell rooms, but, when this was done, also pulled off their dusty, worn clothes and threw them about the room where they had worked so long. And you should have seen the colors of those worn-out mill scraps, and the clothes turned wrong side out in the haste of removal! They were every shade of red, yellow and brown. Because of this, the leaves gradually became brightly colored as the work went on.

All this work was not done in a single day. In fact the Greenleaf Men in some of the leaves begged for a little more time to work, so that it was several days before all the leaves were colored. And how different the colors were: Where the little millers were in a great hurry they left the scraps and garments badly scattered, and in such leaves, the colors were very bright. Where they were less anxious to get to their winter homes they took more care, and in such leaves the colors were duller.

But the Greenleaf Men were not the only ones who were busy. Other workers, especially those who change the starch into sugar, were equally busy going through the leaves and hunting for any chance bags that might have been missed. They quickly changed this starch into sugar, and sent it to the twigs for winter storage.

Still other special workers had an important task to perform. They were the ones who had been employed during the summer in making thin layers of cork over the outside of the new twigs, so that the Waterboys could not escape through the thin bark. Now they had begun work in a new place. They crowded down the leaf stem to its very base, where it joined the twig, and began to build a thin layer of cork right across it, level with the surface of the stem. The parts of the leaf stem which they covered last were the tiny tubes which carry the water from the twig, into the leaf; and the food which the Greenleaf Men make in the leaf, back into the twig. These they did not shut up until the Greenleaf Men had gone into the twig with whatever parts of their mills were worth saving.

If you look closely at the scar where a leaf has fallen off you will see the layer of cork over it, and the little dots where the workers filled up the tubes after the last of the Greenleaf Men had passed. This cork is not only of use in keeping the twig from drying out during the winter, but also in causing the leaf to break off smooth with the stem and to fly away on the wind. It would not be well for the dead leaves to cling to the twigs, for they would catch so much snow during the winter that its weight would almost certainly break the limbs.

You may be wondering where the Greenleaf Men go to spend the winter. If you scrape the thin outer bark from a twig you will see them. They have found that enough light creeps into the inner bark to turn their mills, so some of them rebuild their machines, and do a little work all winter. There are many others which have on white clothes, and therefore cannot easily be recognized as Greenleaf Men. They sleep in the soft inner bark all the way down the trunk of the tree. They rest there quietly until the buds begin to swell in the spring, and the sap flows upward. Then they awake and float up in it, and as soon as the little leaves come out, are ready to take their places in the cell rooms and to work again during the whole summer.

XVII

PLANT BABIES

Did you ever see any one who did not like a sweet, clean, healthy baby? If you did it was certainly a very strange person.

We like not only our own babies but also all kinds of baby animals,—calves, colts, kittens,—just any soft, helpless thing. And yet I suspect that there are many children, and grown people, too, who know nothing about one of the most interesting of babies. I refer to the baby Plants, and I am going to tell you how I first came to know them as real babies.

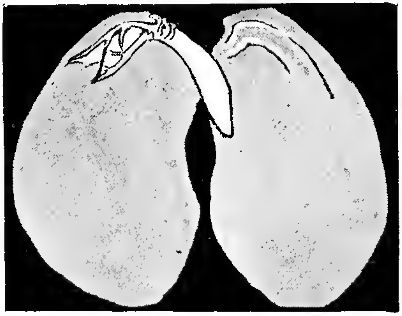
One day in the early spring, after the sun had warmed the ground, I put some beans which I had bought for seed, into water to see if they would sprout. After they had soaked for two days I took a few up in my hand to see if they showed any signs of growing.

As I looked at them I heard a sweet little laugh so low that I could barely catch it, coming from them. Thinking that the sound must have come from one of the beans, I put my face down close to them and said, "Who are you and what is it that makes you happy?"

Another laugh, clearer than the first, came from the fattest of the beans, and a tiny voice as soft and sweet said, "I am baby Bean, and I am happy because I feel so good. I have just waked up from a long sleep, and now I am ready to grow until I become a large bean vine like my mother."

"Well, well," I answered. "I thought that you were just an ordinary seed. I never thought of you as being a 'Baby Bean,' as you call yourself."

"I am a seed," came the prompt answer, "but do you not know that every seed is a baby Plant, or at least has a baby Plant wrapped up in it? If you do not believe me, take off my coat very carefully and see what I am."



TUCKED IN BETWEEN TWO LEAVES WAS BABY BEAN

After returning the other beans to the dish from which I had taken them, I began with great care to remove the hull, which had begun to burst.

"Be very careful now," the little voice warned, "or you will break off my seed leaves which mother packed full of food for me, and then I shall starve. She put it into them so that I may eat it while I am getting my roots into the soil and my leaves up into the air and light. By that time I can get water and food for myself. Spread them apart a very little way and peep in here and you can see me."

I did as was suggested, and there, tucked in between two little leaves, was the face of baby Bean looking out at me. Below this was the little body, which was to become the long stalk of the bean vine; and at the end of this the tender root had pushed so hard against the hull that it had broken it.

"Now you can see in what a snug place I have been sleeping all winter," the voice continued. "Mother tucked me in this way last autumn before she quit giving me water and before I went to sleep. She could not live through the winter, you see, and neither could I, had she not let me dry up so that the freezes could not hurt me."

"What waked you?" I asked.

"The Waterboys," was the answer. "They crept in through the tiny hole which mother left for that purpose, and whispered, 'It is warm, baby Bean, and time for you to wake and begin to grow.' But if it had not been warm I should never have waked. The Bean babies sleep very soundly when it is cold, and if the Waterboys had tried to wake us when it was too cold we should have died rather than start to grow.

"As soon as my eyes were open I began to breathe the air that was inside of my coat and to suck up the food that mother put into my seed leaves. The Waterboys helped me there, too, for they went into the leaves and made the food soft, just as it had been when mother put it there last summer."

" What would happen to you if I should take these parts you call your 'seed leaves' away?" I asked. "Would it kill you?"

"Not at once," was the reply. "But I should soon starve to death. Mother told me of a Bean baby that one day came up near her, and got one of its seed leaves broken off just as it was coming through the ground. It grew very slowly, and at last was crowded out and killed by the other Beans that grew near it. It was weak, just as you would be if you had half of your food taken away from you. I know I should starve to death very soon if both seed leaves were taken away, for it will be several days before I can make food for myself.

"I am getting quite dry now, sir. If you will be so kind as to put me into the damp earth I will eat my food and grow and soon push up through the ground to see you again."

I took my new friend, along with the other beans which I had been testing, into the garden where I wished them to grow, and as I drew the earth over the one with whom I had talked it said, "Good-by. In a few days I shall see you again, but I will be a fine young Bean vine then."

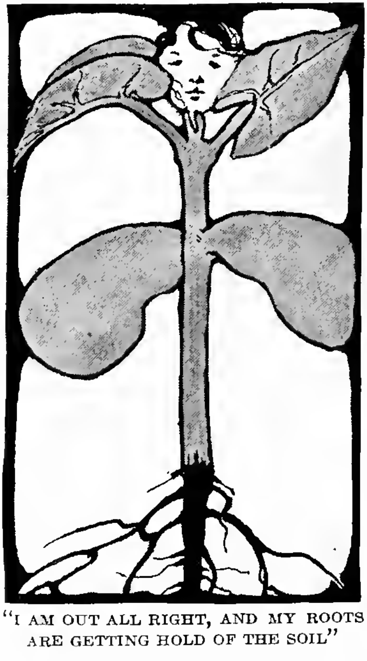
In this way I learned what you may see for yourself, if you care to try: that every bean is really a wonderful Bean baby.

They are wrapped up so snug that they may sleep for years and still be waked by the Waterboys to grow into strong bean vines like the mothers which formed them.

XVIII

HOW THE BABY BEAN GOT OUT OF THE GROUND

During the days following the one when I put the Baby Beans into the ground, I went to the garden many times to see if they were coming to light. At last I found that the crust, which rain had made on the surface of the ground, was broken as if something were pushing it up from below. I carefully removed the broken piece and found under it what, except for the color, looked like a fence wire, bent upon itself and pushing up through the ground. This was certainly the Baby Bean that had talked to me when I planted it. It was now beating the others up because it was so large and strong.



"I AM OUT ALL RIGHT, AND MY ROOTS ARE GETTING HOLD OF THE SOIL"

"I am coming," it said. "Just wait a little while and I will lift my leaves up and laugh in the sunshine."

I could not stay to watch it then, but when I returned in the evening, I found a fine young plant spreading its leaves to the sun and air.

The stem had straightened up and lifted the seed leaves above the ground. They were turning green and were a little larger than when I had seen them before; while between them, smiling and bowing to me, was the tiny bud-face of the baby Bean with a tender leaf on either side.

"I am out all right," said the sweet voice as I bent over it. "My roots are getting hold of the soil so that they will soon begin to send me food and water, and the Greenleaf Men in my leaves are starting their mills. That means that I will soon have all the starch that I want to eat. It is time that I was able to care for myself, for the food that mother gave me will not last many days."

"Why do you call these hard, thick yellow things leaves?" I asked. "They do not look like leaves to me."

"Well, they are leaves anyway, no matter what they look like," was the reply. "You can see that they are turning a little green now. That shows that there are Greenleaf Men in them. But mother packed them so full of food for me that the sun cannot get into them. This makes the Greenleaf Men move off into other parts of the plant. Therefore, when I get all the food out of them I let them drop off. If you will look at the first baby Pumpkin that you find, you will see that his seed leaves have grown and turned dark green. That is because mother Pumpkin put just a little food in them and filled them up with Greenleaf Men all ready to set up their mills and go to work as soon as the sunlight reached them. Many mothers do that, but I like my mother's way best. If I have plenty of food, I can grow all of the Greenleaf Men that I want.

"Some plant babies, like the Pea in the next row there, have so much food in their leaves that they cannot pull them out of the ground at all. Such babies are strong enough, though, to push up from deep within the soil, and to live a long time without making food for themselves."

"Well, well," I remarked, as the little fellow paused for a moment to get breath, "you plant babies are wonderful creatures. I shall certainly get acquainted with others."

"One of the queerest things that you will see," continued my tiny companion, "is the way that baby Pumpkins get out of their coats. You should watch one. Their seed leaves are so thin, and their coats so thick and stiff that they could never slip them off if they did not have a special way of doing it. The roots grow downward and get hold of the ground, first, just as mine do. Then as the stem begins to grow upward a little 'toe' pushes out from the bottom of it and catches the coat and holds it down. The stem then grows and pulls the seed leaves out of the coat. Sometimes the 'toe' slips off, and the coat hangs to the seed leaves until it smothers them and the plant to death.

"If I had time I could tell you of many other kinds of babies, but it is almost dark and I cannot talk much longer. I will just tell you about the Corn babies. When they come up, they look like little white pegs pushing through the ground. That is because their mothers give them only one leaf to start with, and it rolls up tight to push through the soil. The Corn mothers put little food in the leaves for their babies, but they pack plenty around them, just under their coats.

"It is almost dark, now, sir, so I must stop and go to sleep. Good-night."

I returned the good-night, and left my baby friend to sleep and rest until the first light of the morning should wake it to begin its busy day's work.

XIX

WHY THE BEANS CLIMB

It was a long time after I had talked with the baby Bean who had just come through the ground before I saw it again, for I went away the next day to stay several weeks. However, when I returned, I lost no time in getting out to the garden to see my little friend. It was no longer a baby at which I looked; it was a great vine. It had grown so fast that the man who tended the garden for me while I was gone had put a pole beside it, and its highest flowers were above my head. There were flowers all along it too, and near the ground were pods as long as my finger.

As I came near, I said, "Good morning, Friend Bean, you have certainly grown well since I last saw you. Tell me what you have been doing while I have been away."

"Thank you, sir, I shall be glad to," it answered. "I really think that I have done very well, but you gave me a good chance. The soil was in fine condition and full of the food that I like; the Waterboys came down just often enough to give me what I wanted to drink and no more; and the gardener kept the weeds cut so that they could not steal my food and water.

"I had no reason you see for failing to grow. You remember, too, that I was a fat baby. That helped me to get a good start and for that I often thank my mother."

"One thing I should like to know, if you can tell me," I remarked. "Why do you Beans climb instead of becoming strong enough to hold yourselves up like many other plants?"

"Well, it is this way," was the reply. "A long time ago all beans grew low, like my little cousins, the Bush Beans, over there on the other side of the garden. But after a while other plants began to grow taller than we, and kept the light from us, so that our Greenleaf Men could not do their work. The Bush Beans moved to places where the soil was not good, or where it was too dry. They left their old and better home to the taller plants. In these new places they could get the light, for there were not so many plants.

"My people, however, did not like this way of doing things. They thought that they had as much right as anyone to the good soil. At first they decided to make long, stiff stems so that they could reach as high as the other plants, but one of them was very wise and thought of another way.

" 'We do not need to make a stem strong enough to lift our leaves up to the light,' he decided. 'Do as I tell you and we will get higher than the highest. Make a very long slender stem, but always grow a little faster on one side than on the other. That will cause you to twist all the time in the same way. As your tip swings around, you will touch the stem of one of these neighbors of ours that thinks it is growing so tall that it will shade

"WHY DO YOU CLIMB INSTEAD OF HOLDING YOURSELVES UP LIKE OTHER PLANTS?"

us to death. And what will happen then? Why, your stem will wind around its stem and in a little time you will be nodding your head in the sunlight above its highest leaf.'

"To some of our people this plan did not seem quite right, but the wise one said that it was just as fair to get up in the world by being smart as by being strong, so all except the Bush family which had moved away, did as he advised. We do not hurt the plants upon which we climb, as you can see by the fine corn stalk with a Bean vine all over it, in the garden, farther down.

"Look at the young Bean in the next row. It is trying to find something to climb on, just as I was a few days ago. Its tip will swing around until it touches a corn stalk, or anything that is stronger than it, and then it will wind around that.

"After we learned how to climb, many other plants followed our example. Some, like the Hop in the corner of the garden yonder, do just as we do, while many have found other ways.

"Cousin Pea, as you can see in the row behind you, makes a long finger out of the middle vein in each leaf, and wraps it around whatever comes within its reach. In this way, it holds itself up to the light. The grape vine makes strong arms, or tendrils, out of some of its branches, and with these it holds to the branches of the trees or to anything it wishes to climb.

"The blackberries and roses have sharp thorns which hook down and with these, they pull up into bushes and small trees. When the wind blows, the briers push above the twigs, and as they start to slip the thorns catch.

"Still others, such as the poison ivy, send out little roots all along their stems and fasten them to the bark of trees, and even to the side of rocks up which they wish to climb.

"These are all very good ways, but we Beans are well satisfied with our way."

"I am very grateful for all that you have told me," I said as I started to go, "and I am surprised that you plants should learn to do so many things and do them so well."

"I suppose that it does seem strange when you first think of it," was the reply, "but you must remember that the same God made us that made you, and that we enjoy doing our best and improving just the same as you do."

XX

PLANT BABIES WHO FLOAT AND SAIL

I HAVE told how the mother plants wrap their babies in strong, waterproof coats, and give them food to eat when they wake in the spring. Let me tell you of Plant babies who are given sails or floats by their mothers so that they can travel far over fields and forests to find new and better places in which to grow.

Are you acquainted with the Maple babies? I am quite sure that you are, and that you have noticed the broad, thin wing which extends out from the round pocket in which the baby lies fast asleep. What we call the maple seed is much more than the baby plant. It is really the baby and its flying cradle.

A MAPLE SEED IS REALLY THE BABY AND ITS FLYING CRADLE

Stand by a maple tree when the seeds are falling and watch them. When the wind loosens one from the branch it drops rapidly for a few feet. Then the wing catches the air and the whole "cradle" begins to whirl. This causes it to sink very slowly, and as the wind gets hold of it, it is carried far away from the tree upon which it grew.

The little "cradles" never leave the tree except when the wind blows. Mother Maple wants her children to fly away to a new home where they will not be crowded by each other, nor shaded by her own limbs, so she holds them until the wind pulls them quite hard. Then she lets them go, and how they fly! I have found them almost half a mile from the parent tree, out in a field far from any other maple. Had it not been for the wings which mother gave them, they would have fallen around her roots with thousands of their sisters, and would have crowded each other to death, or have been shaded by the limbs from which they came, so that they could not grow.

There are many other ways in which mother plants enable their babies to fly to better homes. The little Dandelion mother, for example, could not aid her babies by making wings for them such as mother Maple provides. She is so low that the wind could not catch them. But she has a way that is even better. Perhaps you have taken the fuzzy head, which comes on the stalk a few days after the flower is gone, blown the little tufts of down off, and watched them float away on the wind. Did you know, when you did this, that you were starting a whole family of Dandelion babies out into the world to find new homes?

Catch the next little plant-sailor that passes and examine it. You will find that it is made of three parts. At the top is the tuft of down which serves to hold it up. Below this is a stem, in some cases very short, in others quite long, and on the end of the stem a little brown case in which baby sleeps. We have again, you see, a flying cradle such as we found with the Maple babies, but it floats instead of sails.

Floating babies travel much farther than those which sail, for the wind often takes them up above the tree tops, and may finally drop them miles away from where they grew.

Thistles, daisies, wild asters, milkweeds, and many other plants send their babies across the country in this way. So many do it that during late summer and autumn the air seems full of their white down—wee plant travellers hunting for new homes. In this way one big thistle, growing by the road, or in the fields of some careless farmer, will scatter its seed over many farms. This is quite hard on the farmer who wants to keep his fields free from weeds, but it is a good thing for the thistle.

There is nothing more wonderful in the lives of the plants than the manner in which the parents provide for their babies, and make ways for them to travel to new homes.

Watch the plants around you, and really learn to love them, and some time perhaps they will tell you stories as they do me. Let me tell you what one of the Dandelion babies once told me:

I was sitting on a grassy hillside when I noticed the wind carrying many bits of Dandelion fuz past me. At last one lit close by my side and I bent over to see it:

The white down stood above the grass blades, but the little brown seed had pushed almost to the ground. To see it better, I took hold of the top and started to lift it out, but found that the stem clung slightly to the grass. I leaned closer to find why this was, and as I did so I heard some one say, "Please, sir, let me stay here. If you do I will soon be down in the ground, and then I can grow."

"How are you going to get down farther than you are now?" I asked.

"Very easily," was the reply. "My brown cover has little spines along it, sticking up toward the top. They were what caught and held me a moment ago when you started to pull me out of the grass. The wind blows against the tuft of down on top of my stem and pushes it first one way and then another. The spines let me slip down, but will not let me slip up. In this way I push down farther and farther until at last the sharp point of the case in which mother wrapped me pushes into the damp earth. Then I suck up the Waterboys and send my roots down into the soil for food, and soon grow into a young Dandelion plant."

After hearing this story, you may be sure that I did not bother the baby which had come sailing so far. I knew that it had been well cared for by its mother, and if left alone would be quite sure to grow into a fine, strong plant.

XXI

PLANT BABIES THAT STEAL RIDES

While the children of the maple, dandelion, and thistle are flying away on the wind, other plant babies are travelling from place to place in a far different way. You may believe that it is not a good way, but if you were the baby plant I am sure you would think quite differently.

Did you ever walk through the fields in the autumn and get your clothes full of burs, "stick-tights" and Spanish needles? If so, you will understand my condition when I tell you how I first learned of the little "tramps of the field."

I was hunting and had to cross a field which a farmer had let grow up with weeds. My clothes were soon covered with these little "pests," as I then called the seeds. Some were hanging to the surface, while many had thrust their little spears through to the skin and were very painful. I let them alone until I had passed out of the field where they grew, into one which had been kept free from them, then I sat down on a stump to clean them off.

As I took out my knife to scrape them from my clothes I said to myself, "You hateful little things, I wonder why you were ever made."

Before I opened the knife, however, I was stopped by a little voice, coming from near my knee, saying, "Do you really not know why we stick to you? If not, I will be glad to tell you."

"Who are you, and where are you?" I asked, for I could see no one.

"I am here on the side of your knee," came the reply. "Will you please scrape me off."

"Scrape you off?" I answered. "Of course I will. That is what I was starting to do. But I wish you would tell me why you got on me if you are so anxious to get off. I am sure that I did not want you."

"I shall be very glad to do that," said the little voice, "as you seem to understand me well.

"DO YOU REALLY NOT KNOW WHY WE STICK TO YOU?"

"My mother grew in the field which you have just crossed, but she knew that she could not live through the winter. She is dead now as you can see. During the summer she formed me and thousands of babies like me. She wrapped us up in our brown coats and put us to sleep for the winter, with food for us to eat when we wake in the spring.

"She made so many of us in order that some at least might be sure to live through the winter. She knew, however, that if we all fell where she had grown, we would be so thick that many of us would be crowded to death. To keep this from happening she made these two sharp spears like mine on each baby's coat. If your eyes were sharp enough, you would see on each spear a number of little barbs like those on a fish-hook, pointing back toward my body.

"IF YOUR EYES WERE SHARP ENOUGH YOU COULD SEE LITTLE BARBS ON EACH SPEAR"

"We hold to mother's dead body until some animal comes along and pushes against us as you did a while ago. Then our spears stick in, and we let go and ride until we are taken off. We fall where there are no other plants of our kind, of course, for any animal knows enough not to pick off the stickers until it is away from the plants from which they came. In this way we are often carried long distances.

"This looks like a fine place in which to grow, so if you will scrape me off I will go to sleep until the Waterboys and the sun wake me next spring. All my sisters and friends are asleep, and I only waked by accident and spoke to you.

"Good-by. I will see you next spring if nothing happens to me, and if you come this way after I get through the ground."

With this I suppose he really did go to sleep. At least he said nothing more to me.

I went on and cleaned my clothes of the "little pests," as I had called them, but I no longer felt vexed with them. I examined them carefully, and how many different kinds there were! It was wonderful what spines and hooks each baby had upon its coat, put there by the careful mother, so that the little one might catch a ride to a better place in which to grow.

Do you think that these plant mothers, who do so much to help their children to get a start in the world, love them as your mother loves you? I am not sure, but I believe that you will be glad to know that the "mean burs, stick-tights and needles" are really baby plants who are catching rides on your clothes, as well as on the fur of animals and the feathers of birds, to places where they can do better in the world.

They may be harmful to us, but we must not forget that each year they are struggling with all their might to be better plants than they were the year before. We must keep them cleaned out of our fields, of course, not because we dislike them, but because we must care for the plants which we have planted and which do so much for us.

XXII

BABY PLANTS THAT PAY FOR THEIR RIDES

It was a bright still day in late October and I was out tramping through the fields just to see what the birds and animals and plants were doing. There had been a number of hard frosts, and the leaves on the trees were beginning to fall quite fast. I had walked a long distance and was hungry, when I saw, not far from me, a large persimmon tree hanging full of fruit. I soon had my hat full of persimmons and was seated upon an old rail fence under the tree, eating them.

There was no one near, but I spoke to myself, as I often do when alone in the fields or woods saying, "It is certainly fine that this tree bears such good fruit. How many people enjoy it, and how many animals it keeps from getting hungry!"

"Yes, we do feed a great many hungry creatures," said a voice somewhere up in the tree, "but that is not the reason we bear fruit. We think that we have a much better reason."

I am never surprised when anything in nature answers me, so I said in return, "Will you not tell me your reason? I am anxious to know."

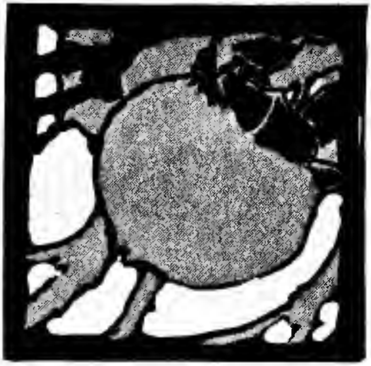
"Very gladly, sir," was the reply. "Do you know what those things which you have just thrown to the ground really are?"

"I suppose that they are baby Persimmons," I answered, remembering what I had learned from the baby Bean.

"You are right," said she. "You seem to know something about plants. I thought you did, when I heard you talking to yourself.

"Each seed is a baby, and we plants want to care for our babies as much as you want to care for yours. We put the sweet flesh around them for their own good, and not for the good of any creatures that may eat it."

"But your babies do not eat it," I said, "and it does not keep them warm. If it escapes being eaten by some hungry animal, it will rot long before they wake in the spring."



"WE PUT THE SWEET FLESH AROUND OUR BABIES FOR THEIR OWN GOOD"

"Quite right again," answered Mother Persimmon, "but you do not understand. If all my children should stay near me, they would soon crowd each other so that all would die, or at least become very weak. Long ago, before my people learned to put food around their babies, they became so crowded into thickets that they could scarcely live. But some were wise enough to wrap a little food about theirs, to see if animals that wanted to eat it would not carry them off.

"When it was ready to eat, they called to the animals to come and get it. The Coon and the 'Possum climbed into the tree and ate all they wanted, and shook down more for the Fox and the Rabbit who could not climb. The birds came and got a share, too. Of course they carried much of it away and when they had eaten the flesh, they dropped our babies to the ground, for we made the coat around them so hard that nothing liked to eat them. Some of the lazy Persimmons would not make food to put around their babies, but they died out long ago, because they all had to stay at home.

"Many other plants do the same for their little ones. Whether they learned it from us, or we learned it from them, I do not know.

"You think, I suppose, that apples, peaches and grapes are made for you, but you are wrong. All these trees make their fruit to pay animals for carrying their babies to places where they can do better. Of course, men make the fruit larger by caring for it, and by planting only those kinds that are best for them to eat, but *we* make it because we love our children.

"Some plants give their babies wings with which to fly; others provide them with hooks and spears with which to hang to animals and birds; but I think our way is much the better. We do good to all that help us, and I think that is the right way.

"Look at that ground Squirrel now, will you! He is slipping off with one of my fruits. He will carry it down the fence to his hole, eat the flesh, and leave my babies to grow in the spring. When the farmer finds the young Persimmon trees after a while, he will wonder how the seeds came there. He does not know how smart old mother Persimmon is, does he?"

LOOK AT THAT SQUIRREL. HE WILL EAT THE FLESH AND LEAVE MY BABIES TO GROW.

The old tree laughed as though she were very happy; and I got down from the fence and started home with my hat full of fruit. My children would eat it, and the baby Persimmons perhaps would live to grow in a new country, far from the mother tree.

"THE LITTLE STRAWBERRIES HAVE THE BEST PLAN FOR MAKING NEW PLANTS"

XXIII

PLANTS THAT NEVER WERE BABIES

A FEW days after I learned the secret of Mother Persimmon's babies, I made another interesting discovery in regard to my plant friends. I was climbing up a narrow ravine beside a trickling stream of water which looked as if it might soon be caught in the act of slipping out of a ledge of rock, cold and clear from its long rest deep within the hill.

I was not mistaken. As I pulled myself onto a great boulder, I saw the water tumbling with a laughing splash from the edge of a rock. It stopped for a time in a basin as large as my hat, and then slipped out among mosses and ferns to continue its travels down the hillside.

As I sat upon a stone to rest, and with a leaf-cup to dip a drink from the basin, I noticed that I was surrounded by a thicket of wild raspberries. Most of the leaves had fallen. Only a few, dark purple in color, clung here and there, making the shining stems more beautiful.

As I looked more closely, I observed that the end of each long, slender cane was buried in the leaves. Taking hold of the one nearest me, I tried to lift it up, but found it holding fast. I was curious to know why this was, so I caught it close to the ground and gave it a sharp pull. This brought it out, but there came with it a bunch of roots and more than a handful of leaf-mold and soil.

If roots and soil had been all that came from under the leaves, I should not have been surprised; but a sharp voice came, too, with a force and in a tone that sounded as if pain had caused it.

Feeling sure that this was a new plant friend speaking to me, I said, "Why do you cry so, Baby Plant? I am sorry that I have hurt you, but you shall be well cared for. I will take you to my garden, and you shall have a new home. It may not be as beautiful as this, but you shall have plenty of rich soil and as much room as you wish in which to grow. How will that suit you?"

"Not at all," was the prompt reply. "I want to grow here. This place suits me perfectly. I am not one of your garden plants. I want to grow near my friends, and in the shade of the trees here by the spring. And I am not a 'Baby' either, if you please."

"Well, well," I answered. "If you feel that way about it I can replant you right where you came from. I do not want to hurt you. But I did think that I was correct in calling you a baby plant. I have become acquainted with so many kinds of plant babies. I just supposed that you were a new kind. If you are not a baby plant, perhaps you would be willing to tell me what you are."

"Put me back where you got me and I will," came the answer, as sharp as one of the thorns scattered along the stem.

I did this quickly and then stopped to listen.

"No, I am not a baby," came the voice, seemingly in a better humor than before. "I may be small, but I am not a baby—am not, never was, and never will be. After a while I may form a great many seed babies, but they will not be likely to grow. We make them to feed the birds. We can spread as fast as we want to in the way which you see us doing all about you. Don't you see how every cane is making a new plant by touching its tip to the ground? In this way we increase a little from year to year without having any seed babies to care for."

"This is very interesting," I remarked, "but I wish you would tell me just why it is not right to call you a plant baby. You are certainly very small, and will grow into a large plant."

"Of course I will, since you have planted me back here, but I am no baby. I am a part of mother now, but next spring her stem will die, the buds here close to my roots will grow, and then I will be a really new plant. But I never was a tiny thing wrapped up in a coat and put to sleep for a long time. That is the way plant babies are made. I am no baby. I can't explain all about it, but I know."

"Very well," I answered, "I suppose that you are right, though it seems strange to me. Are there many kinds of plants which do as your mother did, make new plants which were never babies?"

"Lots of them," was the reply. "Look at the blackberries over there. They are cousins of ours, but they have quite a different way of doing things. They make a world of seeds, just as we do, but these don't often grow. The young blackberry plants spring up from the roots of the mother plant and in that way the blackberry patch spreads and spreads until it covers whole fields.

Grape vines do about as we do. A branch will fall to the ground and roots grow from each joint. Then a bud will grow into a new top, the old stem which connected with the mother plant will die, and a new plant will grow up which was never a baby.

"The little strawberry people which grow farther down the hillside, however, have one of the best plans for making new plants, in this way: They send out a long shoot with a little plant growing on the end of it. This pushes out far enough to allow the child to grow without bothering the mother. Then the little plant sends roots down into the ground. When it can get what it needs for itself the mother stops sending it food through the stem. The stem then rots away, and there is a new plant ready to grow and send out shoots to make new plants still farther on. In this way strawberry patches spread to cover large amounts of ground with never a seed baby growing into a new plant.

"You may wonder why we all keep on making seed babies, if they do no good. Well, it is a little strange, but we got in the habit of doing it long, long ago, and it is hard to stop. Then our seeds, and the food which we put around them, do so much good to the wild things which feed upon them that we would gladly do the work for them if for nothing else. The greatest reason why I did not want you to take me away from here was because I would have had to leave my bird-friends. I could have fed you and your children, of course, but you men have plenty to eat, anyway. You have taken so many of us wild plants into your gardens that you ought to leave those of us who want to stay in the woods and fields, to live with the creatures who have been our friends for ages."

The lesson which I learned from the plant well repaid me for my climb, and also for putting the little raspberry back into his native soil. I went my way, leaving him happy in the midst of his wild friends. I was glad that I had been taught a lesson, not only about how plants grew, but also about how the wild things which live together are helpful to each other, as well as to us when we bring them to our homes to make food and beauty for us.

XXIV

TWIG BABIES

One morning in March when the south wind was blowing gently, and the bees were beginning to hum around the door of their hive, while robins and bluebirds sang from the apple trees and fence posts, I went down to the stream back of my home to "watch spring come," as I said to my little boy who trotted by my side.

While he hunted for the violets which were beginning to peep out on the sunny banks, I climbed upon a large rock standing by the water and began to watch a ground Squirrel a few feet from me, hunting for nuts which he had hidden there the autumn before.

A maple tree stood near me, and one limb hung so low that the twigs touched my face. I seemed to hear a strange sound, like the laughing of many tiny voices, but I could not tell whence it came. At last I thought of the little maple buds, so I pulled one very close and whispered, "Is it you that I hear laughing, little bud?"

There was no mistake now. Right from the bud came a silvery laugh, and after it a voice equally sweet and soft, saying, "Yes I am laughing, and so are all the other Twig babies. The warm wind and the sun waked us early this morning, and we are happy. We are all taking drinks of the sweet, fresh sap which Mother Maple is sending us, and we soon will be so fat that we will burst our water-proof coats; then we can look out and see you and the sunshine and all the beautiful things which we know are about us.

"You see we have been asleep a long time. We were born last spring while the leaves were very young, but went to sleep early in the autumn. We have just waked for the first time.

"LOOK, MY COAT HAS BEGUN TO SPLIT"

"While we were young and tender, we were kept from harm by the strong leaf stalk that grew almost over us. By the time the leaf had to fall off in the autumn, Mother Maple had made a coat for each, so warm and tight that the rain and cold has not been able to hurt us all winter. Look, mine is beginning to split now. Before night I will have it off and be free to grow as fast as I like."

"If I should be very careful," I asked, "do you think that I could help you get your coat off?"

"Yes, I am quite sure that you could, and I will be so glad if you will," was the reply. "I have had it on so long that I am tired of it."

With the point of my sharp knife I carefully split the coat and lifted it from the delicate scales beneath.

"Oh, thank you," said the little Bud as it seemed to take in a great breath of fresh air, "these other things are my under garments, and I can easily shake them off. They are soft and warm, you see, just to keep out the cold."

"And what," I asked, "are those tiny green parts which I can barely see beneath them?"

"They are my leaves," was the answer. "I am made of a little short stem just long enough to hold as many leaves as will be on me when I am a full-grown twig. Each is very small, of course, but by being started the summer before, they can grow and get to work very early in the spring. If Mother Maple had to make all her leaves and twigs in the spring after she wakes, she would not be able to grow half as large. We wake before she does, and begin to make food for her while she is still asleep. Every leaf that will appear upon the tree this spring is here now wrapped up inside of a bud coat, and has been ever since early last summer."

"Are all buds like you?" I asked as the little bud stopped for a moment.

"Not exactly," was the answer. "Some trees, like the Hickory, have much thicker coats than we, while some, such as the Sumac, have scarcely any. Others, like the Sassafras, have flowers, leaves and stem in the same bud, while still others have nothing but flowers.

"Then there are the Tulip tree buds which are different from any that I have ever seen. Their bud-coats are thin and flat, and sealed together at the edge. Inside is a leaf, so big that you will have no trouble in seeing it, yet so carefully folded that it requires little room. Under this leaf is another coat, covering another leaf. In this way there is one coat after another, each protecting a leaf, each ready to open out and get to work as soon as the sun wakes it in the spring. You should get one from that tree across the creek and see for yourself how wonderfully it is made.

"Some buds do not make branches at all, becoming flowers instead. But mother says that a baby flower is really a twig greatly changed. I am sure I do not know, but she is usually right.

"Those fat buds there on the branch are Flower babies. You could see the tiny Flower people if you should pull it to pieces.

"Look at that brier climbing over the rock there and you will see how mother Plants take care of their Twig babies in a different way. They do not hold them up above the ground as my mother does, out of reach of animals that might eat them; they leave the old leaf-stem standing guard over each baby. They also make a big, sharp thorn on each side of it, and to be sure that nothing will get at it, send out two little arms from the leaf stalk and wrap them around the stem and bud."

By this time my little boy had become tired playing along the creek and was calling me to take him home, so I bade the little Twig baby good-by and went away, promising that I would come again to see him after he had grown into a branch with many waving leaves to shade me.

XXV

FLOWER STORIES

The Little Flower People

"Spake full well in language quaint and olden,
One who dwelleth by the castled Rhine,
When he called the flowers, all blue and golden,
'Stars, that in earth's firmament do shine.'

'Everywhere about us are they glowing,
Some, like stars, to tell us spring is born;
Others, their blue eyes with tears o'erflowing,
Stand like Ruth amid the golden corn."

Surely all who have eyes enjoy flowers, and even the blind can take pleasure in their fragrance. Did you ever try to think what the world would be without them? We would scarcely know how to live.

But with flowers all about us, from early spring until late autumn, when frost kills or puts to sleep the last plant, there are very few who really know them well.

In order that you may know more of the Flower people, and think of them as real friends, I will tell you of what I learned from an apple blossom one evening in May, as I sat on a low limb with clusters of pink-white flowers all about me.

I SAT UPON A LIMB WITH CLUSTERS OF PINK-WHITE FLOWERS ALL ABOUT ME

I was examining and trying to find out the use of the five green parts folded backward on the stem just below the flower, when one of these said:

"By the way you look at us, I am sure you are wondering of what use we five little sisters are. Shall I tell you?"

"I would be greatly pleased to have you do so," I replied, "for you have guessed my thoughts exactly."

"Well," my new friend continued, "if it were not for us, you would have very few apples to eat. When the nights are cool in the spring, and hungry insects are looking everywhere for a bite from a tender plant, our strong bodies are wrapped closely around the tender parts of the flower. In that way we keep safe from harm the little fruit with its baby apples.

"We are the Sepal sisters, and although we may not be beautiful, like some of the other Flower people, our work is of great importance. We think so much of the little fruit, which we protect while it is small, that we never let go of it. If you will look down the outer end of any apple, you will find our dead bodies still clinging there, long after the fruit has fallen to the ground.

"This is my simple story," she said, in a voice so weak that I could scarcely hear it. "My work is done and I am ready to die."

I thanked her for what she had told me, but I was anxious, now, to learn of the other parts of the flower. Would the delicate pink leaves above the Sepals tell me of their life, too? I felt I must find out, so drawing a cluster close to me, I whispered to one of the freshest flowers, "Tell me, little flower-leaves, who you are. And do you do any work in the world other than making every one happy through your beauty?"

"We are the Petal sisters," came the answer in a voice as soft and sweet as themselves. "Our work is, as you say, to be beautiful, but not that people may admire us. We live for the good of the baby Apples, which all the Flower people, working together, make and care for.

"Of course, we are glad to make the world brighter for you, but our first duty is to call the bees to the blossom. Were they not called here by our bright colors, few apples would be formed with plant babies put to sleep within them."

"How is that?" I asked. "Please tell me in what way the insects help to make the apples?"

"You had better ask the Stamen brothers," she replied. "They know much more about the matter than I do. The breezes are calling me to fly away, and as my work is done, I think that I shall go."

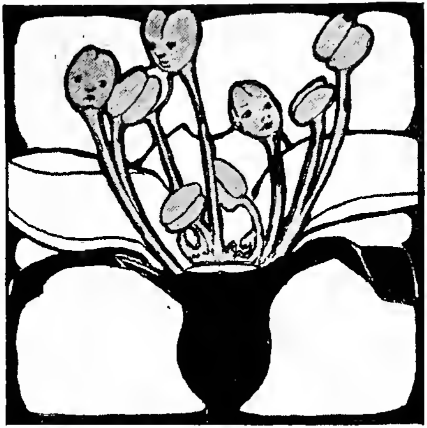
Scarcely had she said this when she and her four sisters let go of the stem where they had grown, and floated away on the wind.

As I turned back to the flower, after watching them for a moment, my eyes rested upon a ring of slender stalks with yellow knobs on their tips. They grew just inside of the places where the Petal sisters had clung.

Before I had time to speak, the tallest of them said, "I am one of the Stamen brothers. Would you like me to tell you the history of our lives, as I have heard the Petal sisters tell you theirs?"

"Yes, indeed," I answered. "While you feel like talking to me, I want to learn as much as possible about you Flower people.

"We Stamen brothers are very important fellows," he boasted. "You may think me vain for saying such a thing, but we are almost the most important people in the flower. If it were not for us, there would never be any seeds, fruit or trees."



"WE STAMEN BROTHERS ARE VERY IMPORTANT FELLOWS"

"Ah," I said. "So you are the ones who make the seed. I am very glad to meet you and your brothers."

"No," he replied. "We do not exactly make the seed; but it cannot be made without our help. You see, it is this way. Within our fat bodies, here, on top of our slender stalks, there are four pockets. In these there live many tiny Cell people and the task of each is to make four tiny balls which you may call pollen grains. These must be carried to the Pistil mothers before they can make a single seed. Some people think that the Pistil mothers are the greatest of the Flower people, but they can do nothing without us.

"If you care to learn more of what the Pollen grains do when they get to the Pistil mothers, you must ask them. I am not allowed to tell more."

"Surely you can tell me how these little balls of pollen get to the Pistil mothers," I said.

"Certainly," he answered, "the bees carry them. There is a little drop of sweetness at the bottom of the flower which the bees like very much. When my pollen grains get ready to be carried away, the Sepal sisters, who protect us when we are young, fold back. The Petal sisters wave their bright dresses and the insects see them and come for the honey. All of these insects are very fuzzy, as you may have noticed, and while they suck up the sweet, I get some pollen out of my pockets and scatter it all over them. They fly to other flowers with it clinging to them, and as they rub over the sticky heads of the Pistil mothers, they leave on them many of the grains sticking fast."

"Do all kinds of plants have flowers like this one?" I asked, "and do the flower people in all do the same kind of work?"

"No, some of them are very different from us," was the reply, "but you had better ask mother Corn about that. She knows more than any one else concerning such things. She is very wise."

I thanked him for this information, and then enquired, "Could you show me some of your pollen grains? I am anxious to see them."

"I am sorry, sir; but I gave the last I had to a bee a few minutes ago. She wanted to use it in making bread, and I had no more use for it.

"My work is done, now, and I am ready to die, so I will let you pass on to the Pistil mothers and hear their story. I see that they are waiting for you."

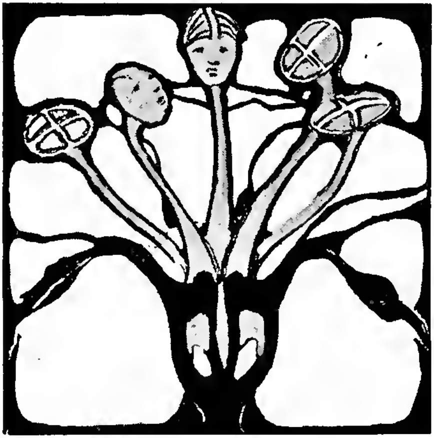
When the little Stamen brother bade me good-by, I looked at the five pale green stalks which seemed to spring from the center of the flower. After a time I could make out a wee face on the one nearest me. Whether it grew as I looked, or my eyes became able to see more clearly, I do not know, but at last it was so distinct that I spoke.

"I suppose that you are one of the Pistil mothers," I remarked as a means of opening a conversation. "Will you tell me of yourself and your life? If you will but do me this favor I will have the story of each of the Flower people."

A smile came over the little face, and in a voice the lowest and sweetest of all of the Flower voices, she answered, "Yes, sir, I shall be pleased to do as you ask.

"If you will look at me very carefully, you will find that my body is made of three parts. The top is my head. It is flat or rounded above and is very sticky. That is to make the pollen grains which touch it, stick there. Below this is my neck, long and slim, to hold my head above my body so that bees which light upon the flower will be sure to touch it. My neck joins my body deep down in the flower, and my body is wrapped close to the bodies of my four sisters. Within it, far from sight, is a little chamber in which the secret work which I have to do is carried on.

"Hidden there, where nothing can harm them, and no one see what is being done, each Pistil mother keeps one or more tiny servants. Each servant knows how to make what no other of the Cell people can make, a very, very small cell which is able to grow into a baby apple tree.



THE PISTIL MOTHERS

"But there is one strange thing about this little Cell. As soon as it is made, it goes to sleep and nothing that the Cell mother or I can do will wake it. One thing only will arouse it to take the food that is provided for it to make it grow. This is a whisper from one of the tiny pollen grains which is made in the pocket of the Stamen brothers. If one of them does not reach the Cell, it will sleep on and on until at last it dies. But when a grain slips down, through my head, neck and body, and enters the Cell where the little sleeper lies and whispers to it, at once it wakes. They clasp hands, and begin working together to form the Plant baby. They never leave each other until the great Apple tree, with roots, trunk, branches, leaves, and at last more Flower people, stands tall and strong with roots deep in the earth, and branches able to bear loads of fruit.

"Now you have the history and secret of my life," she added. "Am I not a really wonderful little Pistil mother?"

As I climbed from the limb where I had been seated, I said to myself, "Yes, the life and work of each of the Flower people is truly wonderful, but the little Pistil mother is right in thinking that hers is the most wonderful work of all."

We have doubtless all read the story of the fairy Princess who was waked from her sleep of a hundred years by the kiss of the young Prince; but how many of us have known that for every seed in the world a Pollen Prince must find and wake a Princess, hidden deep within the body of the Pistil mother, a Princess, who would sleep until her death if he should fail to discover her.

XXVI

TASSELS AND SILKS
OR
WHAT MOTHER CORN STALK KNOWS ABOUT FLOWERS

After my talk with the Flower people of the apple, I was very anxious to learn more from Mother Corn Stalk. But you know that it is a long time after the Apple blossoms are gone that the Corn blossoms appear.

August at last came around, however, and with it tassels and silks on the Corn Stalks. Then I went to the fields to find out that for which I had been waiting.

The corn grew tall and strong and dark in the field to which I went, for the soil was rich, and the farmer had cared for it well.

The sun was setting and the little Corn voices seemed to be laughing and singing everywhere. It may have been only the breezes playing through the leaves, but it was like soft music, and I enjoyed it.

I stepped close to one of the finest stalks and murmured, "Good evening, Mother Corn Stalk, you seem to be very happy."

"Indeed I am," she answered, "and why should I not be? My Root children send me plenty of food and water; the sun has been shining upon me all day, so that my Greenleaf Men have filled my leaves with starch; and now that night is coming on, the other workers are waking to make the starch into things I need for more growth. What more could I ask to make me happy?"

"You are right," I assured her, "and observing that your flowers are out, I came to learn about them. The Stamen brothers of the Apple told me last spring that you could tell me more than any one else about all kinds of flowers. Shall I talk with your Flower people, or will you tell me about them?"

"Well," she said, "they are getting sleepy now, so I suppose I may as well tell you about them:

"You see that I do not let all my Flower children live in the same place. Up in my tassel you will find the Stamen brothers, and those long, red strings which you call silks are the Pistil mothers.

"The Sepal sisters are very small, so small that you can scarcely find them, for it is so warm when my flowers grow that there is no need for the Sepals to protect the other parts. Neither will you find the Petal sisters. My pollen is carried by the wind instead of by bees, so that there is no need of petals with bright dresses.

"Look up at my tassels. Each of those little things, hanging upon a silk-like thread, is a Stamen brother. There are thousands of them, each with his pocket full of pollen-dust. They stay hidden in their little houses until it is ripe; and then they let themselves down as you see them, so that whenever the wind shakes the stalk they can more easily throw their pollen. If it were not so late, I would ask you to jar them a little and see how the yellow dust flies from them; but the dew is falling now, and they have closed their pockets.

"Now look down and see my Pistil mothers. How many do you think there are? I myself cannot tell you just how many, but if you will examine, you will find one for each grain that I will have on my cob. Put your finger on them and see how sticky they are. That part is what the Pistil mother of the Apple calls her head, and it is to catch the pollen grains as they float through the air.

"EACH OF THOSE LITTLE THINGS HANGING BY A SILKEN THREAD IS A STAMEN BROTHER"

"If you follow the silk under the husk, you will find that each piece ends in the body of the Pistil mother, which is carefully tucked away in a pocket of the Cob man so that nothing can harm it. Inside of it is a Cell servant, who makes the tiny Cell which will grow into a Corn baby when waked by the Pollen grain whispering to it. I am sure that the Apple pistil mother told you of that.

"When the tassels are dry, and the wind shakes me, the Stamen boys throw out their pollen until it fairly fills the air. As it floats through the field, most of it is wasted; but a great quantity is supplied to make sure that some will get on each silk. In this way my pollen goes to some other stalk, while that from another, or it may be from many others, comes to me.

"As long as we grow in fields, we get along all right, but when one stalk stands alone it makes few grains, because the pollen from its own tassel is all blown away.

"A great many plants follow our way of getting pollen scattered, and seem to like it well. Did you ever notice the long, fluffy blossoms of the Oak, Hickory, Chestnut, and many other plants? They are the flowers with Stamen brothers in them, like my tassel. The Pistil mothers are so small that you can scarcely see them. They are tucked away in a tiny bud close to the twig.

"Do you see the Persimmon tree over yonder in the next field? It is loaded with fruit, but the one across the road from it has none. It bears the flowers which have the Stamen brothers in them, while the one with fruit on it has only the Pistil mothers in its flowers. That seems to me to be wasteful, for all plants might as well bear both kinds of flowers as I do, and then none could be without fruit."

"Would it be well for all the plants to follow your plan?" I asked.

"Not at all," was the answer. "If the little clover should depend upon the wind to carry her pollen, how far do you think it would go? She is so low that the wind cannot get at her, so she makes honey to pay the bees for carrying her pollen. There are many plants which grow in places where the wind does not strike them at all, and you will find that they call the insects to help them, or do as the wheat across the road did last spring."

"And how was that?" I asked.

"She is a cousin of mine, but I must say, she is a selfish creature. She makes the Stamen brothers grow in the same case with the Pistil mothers, so that it is impossible for the pollen from any other plant to get to them, or for the pollen from her Stamen to get to any other flower. Different kinds of wheat never mix. They are so selfish that they will not even have anything to do with their nearest kin.

"We corn people let our pollen go as far as the wind will carry it and light upon the silk of any pistil that may be ready for it. This, we find, is very good for us, for the baby plant will be stronger if the little sleeping Cell is waked by a pollen grain from a stronger plant."

"Does the kind of stalk from which the pollen grain comes have anything to do with the kind or strength of the baby plant?" I asked.

"Certainly," was the answer. "It has as much to do with it as does the plant which produces the little sleeping cell itself. They became equal partners. Do you see the stalk standing over there with its tassels cut out? Several days ago, before my silks came out from my husks, the farmer put a paper sack over my whole ear. He left it there until my silks were ready for the pollen, and then he cut the tassels from that stalk, slipped the sack from my ear, and dusted the ripe pollen from the pockets of its Stamen brothers upon my silks. Then he put the sack back over my ear, and left it there until he knew that all my sleeping cells were awake.

"Now, you see, he knows that each of my grains will have come from the sleeping Cells which I made, and from the pollen grains formed by the other fine stalks. If he had not done this, the pollen from that slim stalk, with no ear on it, standing yonder would have certainly waked many of my cells; then some of the stalks into which my seed babies should grow next summer, would probably be like the slim stalk and, like it, bear no ears."

It being dark by this time, I went home, glad to have learned so much of interest from Mother Corn.

XXVII

MOTHER CORN STALK'S STORY

Did you ever notice the gentle rustle of the Corn, late in the evening, as a breeze passes over? It sounds like many whispers. I like to think of it as being the stalks of Corn talking together. We cannot understand these whispering voices, but I will tell you the story which a stalk told me as I stood in the corn field one evening in August after sunset.

It was a poor field. The ground was cloddy, weeds and briers were plentiful, the Corn stalks were slim and yellow, and few of them bore ears. Stopping near one of the largest to examine the ear, quite to my surprise, the silk spread apart, a tiny face looked out, and I heard a small, sad voice say, "Good evening, sir."

THE SILKS SPREAD APART, AND A TINY FACE LOOKED OUT, AT ME

I said good evening in return and the voice went on:

"You seem interested in us, so I am going to talk to you awhile. Most people think that we Plants cannot talk, but that is because they do not care for us, or try to understand us."

"I shall be glad to listen as long as you care to talk to me," I answered.

"Please do not think that I like to complain," continued the Corn Stalk mother, for so I knew her to be, "but I believe that it might do other corn good if I should tell you some of the troubles I have had.

"I am sure that you think me a very poor stalk, and I suppose I am, but it is not my fault. I have done the best I could under the circumstances.

"Our family has not had good care for years and years. In fact, I do not believe that we have ever been cared for as we should have been. Mother told me before she died, while I was still a baby wrapped in the husk, that we had been neglected and abused in every way. We have always been treated as we have been this year, and you can see for yourself how that is.

"Worse, if possible, than the way we have been neglected while growing, is the way that our seed has been selected, or rather *not* selected. No thought was given to seed until spring came, and then the men who raised us went to the crib and took whatever they could find. The result was that they often got ears from poor stalks. Besides this, the babies on them had often been damp and cold all winter; many of them were dead, and worse for the crop, many more were so weak that they could scarcely get through the ground. These grew into little stalks, such as you see all about you, too weak to make an ear, even with plenty of food.

"Had the farmer gone through the field in the autumn and taken the best ears from the finest stalks, and put them in a dry place through the winter, the baby plant in each grain would have been of good blood, and also strong and able to grow.

"These, however, are not all our troubles. The Sassafras tree by the fence, there, told me in the spring when I came up, that Corn had grown in this field every year since he could remember, and that has been a good many years, as you can tell from his size.

"That is very bad for us, for we Corn people all like the same kind of food. Where we grow year after year on the same ground the food that we like best becomes scarce. Such crops as wheat, clover, cowpeas, and grass should be grown part of the time. They like certain foods best which we do not like so well, so we would help each other. Besides this, plants give off from their roots a substance much as you give off sweat from your body, which is a poison to others of their own kind, but will not hurt plants of another kind. If corn is grown but once in three years all this poison that one crop throws off will be destroyed or washed out by the rains before another crop is raised.

"Our farmer ploughs so badly, too. His horses are poor, and his plough is worn out, so he only breaks the ground a few inches deep. Then he often tries to cut a wider furrow than he should, and as a result leaves a hard ridge between each one. Then, too, he does not harrow enough to break up the clods.

"With the ground in this condition the grains in which we slept were dropped down and covered, often with clods. Do you think it strange that we look sickly and do not make much corn for him?

"The hard ridges and clods make us very angry, at least those of us who have enough strength left to get angry. They are like good food on your table shut up in jars which you cannot get open. You can see it, but cannot get it. We can smell the food in the hard places, but our roots cannot get to it. The clods do not let the Waterboys in either, and so these run away on top of the ground and carry with them the best soil that they can pick up, leaving us to go hungry and thirsty.

"To make matters still worse, the farmer lets weeds and briers grow up and steal much of the little food there is for us. If he would only plough deeper we would have more food. We can smell it below, but because the ground is too hard for our roots to enter, like that in the clods, it is out of our reach."

"Why does the farmer not do better?" I asked. "It would surely pay him well to treat you more kindly."

"Indeed it would," was the reply. "The trouble is that he does not know any better. I am sorry for him much more than I blame him. He gets along badly because he does not know, while he might get along well if he only understood better how to care for his land and his crops.

"One reason why I wanted to talk to you was that you might go and teach him. It is too late now for it to do me any good, but it might help other plants."

With this she said good night and started to draw back into the husks, but before they had closed over the little face she added, "I am a poor stalk, but I have done the best I could. My ear may possibly be taken for seed, and if it is you may be able to help some of my babies to have a better chance in the world than I have had. If you can, I thank you, for they may never have the chance to thank you for themselves."

XXVIII

THE SEED EAR'S STORY

I HAD been tramping through a large cornfield all afternoon with my friend, watching him select seed corn, and when I went to my room at night I was very tired. It had been one of those perfect September days, clear, still, hot in the sunshine, cool in the shade, when it is a joy to live on a farm.

A fine supper had rested me, but had made me sleepy as well, so I bade my friend good-night early and went to my room. However, I did not go to bed at once, as I wished to look over a fine basket of seed corn which he had given me, to see if I could remember all that he had said was required to make a good seed ear.

I took a number of ears out of the basket and placed them on the table in front of me, putting in the center the one which the farmer had said was, "good enough to take a prize anywhere."

SURELY MY PRIZE EAR HAD SPOKEN TO ME

As I looked at them my head began to nod, but suddenly I sat up with a jerk and looked hard at my corn. Surely my prize ear had spoken to me! In a moment there was no doubt about it, for it spoke again.

"I beg your pardon, sir," it said, "I fear I have spoiled your nap. I am very sorry."

"Do not make any excuses, please," I replied. "If you will talk to me I will be glad to listen to you. all night. I wish you would tell me just what it is that makes you better than the other ears, and how you came to grow as you did. That was what I was thinking about when I fell asleep."

"Very well," answered the ear, "but I like to see people clearly when I talk to them. I have to look out between these grains now, and I can scarcely see you. Please shell some of them off on the side next to you, and then I can see you all right."

I did as I was asked, and soon found a fine little face smiling at me. It was the Corn Cob man, the son of mother Corn Stalk, who holds all her babies for her.

"You never saw me before, did you?" he said with a laugh. "We Cob men usually die before the grains are taken off, and if we do not, we draw our faces so far back into our bodies that no one ever sees us. I am very strong and may live quite a while yet, though my work is all done.

"There are a number of things about me which make me a good ear," he continued. "In the first place my body, the Cob, as you call it, is strong and light and of medium size. It will not easily break, and waste the grains; it dries out quickly after I am dead and put into the crib, and yet is not so large as to take up more room than is necessary.

"Then notice that you cannot see my body anywhere except at the end where it grew fast to the stalk. In most cases a little of the Cob man's body shows at the tip, but mine is covered with nice, fat grains. In that way I can hold much more corn.

"My rows are straight, too, and run my whole length. This, also enables me to hold more grains.

"If you will take me up and try to bend or twist me, you will find another good thing about me."

I did as he suggested, and found that the whole ear was almost as solid as a stone.

"Do you know why I am so solid? It is because my grains are packed so full of food for the babies wrapped in them, that they are pressed tightly together. If you will notice their shape you will see that they are like little wedges, wide at the top and narrow at the bottom. That makes them fit close all along. All fine ears have their grains like that. See how long they are, too. I have more corn on me than many ears that are larger than I am.

" Another reason why the farmer selected me was, that I grew close to the stalk on the short shank."

"Yes," I replied, "I noticed that, and also that there was another ear on the stalk, almost as large as you are."

"My people all do that when they are well fed," he answered. "Only a few used to do it, but for years the farmer has been going through his fields each autumn, as he did to-day, taking the finest ears from the best stalks that had two ears on them. Of course, children are like their parents, so from year to year we have become more and more like the corn he wants us to be. It pays him well to do this, for we now give him from ten to fifteen more bushels of corn to each acre than we did when he began to care for us in this way.

"All the Corn babies in my grains are not exactly the same, either. Some are better than others. I suppose it is that way with all children. If you plant them you should go through the field again next autumn and take seed only from the best stalks. Some may make ears that are real 'scrubs,' for mother still has a little bad blood in her.

"Our farmer treats us well in other ways, too. Did you notice how soft and fine the soil is? And there is not a weed anywhere. He ploughs the ground deep and breaks up all the clods before he puts the seed in. Then he only stirs the top of the soil enough to kill the weeds and keep the Waterboys from flying away, so our roots are never harmed. They scarcely ever strike a clod, so can go wherever they like when hunting for food.

"Besides this he never plants us twice in the same field without growing some other crop in it for two or three years. One of these crops is always Clover or some one of the Clover family, and they, you know, take food for us from the air. Then he always feeds every bit of our stalks, leaves and grain to his animals, and they make great loads of manure which he puts on the land for us."

I do not know how much longer he might have talked, had not the farmer's dog barked at this point. The noise seemed to frighten my little Cob friend, for his face disappeared and I never saw him again.

Thought I have not seen him since, his story and the vision of his happy little face will never be forgotten. I often think of him as I see fields of corn growing or loads of it taken to market. I always remember the work of the Cob men, bearing upon their bodies the Corn babies with the food that mother Corn provides for them.

XXIX

THE OLD APPLE TREE'S STORY

Last summer I visited a friend whom I had not seen for five years. In the cool of the evening, while he and his son were in the pasture milking, I walked out to an old orchard from which I remembered one could obtain a very fine view of the setting sun.

When I reached it, however, it looked so different from five years before that I began to think I had gone to the wrong place. The trees then had seemed almost ready to die. In fact, my friend had said while we were looking at them that he was going to dig them up the next winter. There were then only little, knotty, almost worthless apples, now each tree was hanging full of fine, large ones, and one big fellow standing near me seemed to have half a dozen kinds on it.

What had happened? I did not have to wait long to find out, for as I came near the tree with the many kinds of fruit, a voice coming from somewhere up in the top, answering the question in my thoughts, said:

"Yes, we are very different from when you last saw us. And it is all because the farmer's son went to school and learned how to take care of us. I remember you well, and what the farmer said to you about digging us up.

THEN THE TREES HAD SEEMED ALMOST READY TO DIE

"At Christmas time, after the son had been at school for several months, he came home to stay two weeks. While looking over the farm he and his father passed by here and I heard the father say, 'I am going to cut every one of those apple trees down. They are of no value, and I will put the ground into corn and get something out of it!'

"'You had better leave them, father,' the son answered. 'If they were cared for as they should be, I am sure they would give you plenty of fruit. Let me begin work on them right away, and we will see what they will do in a few years.'

NOW EACH TREE WAS HANGING FULL OF FINE, LARGE APPLES

"As they went away I heard the father say, 'All right. You may do what you please with them, but I will be able to eat all the good fruit that you will ever get from them. I have known them too long. They are no good.'

"The next morning the boy came out early with a saw, a knife and a ladder, and before night, half the limbs in the orchard were lying in a great pile over there by the road.

"We all thought that he intended to kill us bit by bit instead of cutting us down as the father proposed, but we did not die.

"After he had finished cutting us to pieces he came back with a bundle of little switches and cut at us some more. He climbed all over us and cut off our limbs, split them, and stuck little pieces of the switches into the cracks. Then he pressed a bunch of wax all around the ends where he had done this. He said he was 'grafting,' but we had no idea then what he meant by that.

"When he had finished this we supposed that he was through working with us, for he took his ladder away with him, but we were wrong. The very next day he came back with a big plough and the black mules. And then we were sure that this time he would tear us out by the roots.

"The ground had not been broken up since we were planted twenty years before, so our roots were close to the top of the ground. And how he made them crack, and how we did groan!

"We were only half awake then. At that time in the year we are usually sound asleep, but it was quite warm and some of us had roused up a little.

"When the warm winds and sunshine and rain of April came, and we waked in earnest, we found that we had not been hurt in the least. The soil about our roots was so soft that they could push through it as never before, to find food, and the leaves on the branches which he had left, grew so much larger than our old ones that we were soon getting more food through them than we had usually obtained.

"The little twigs which he had stuck into the ends of our branches where he had cut them off, grew into strong branches. They looked finer than our old ones, too, and we are very proud of them.

"Many times during the summer our friend, for now we believed him to be that, came with his plough or harrow and cultivated the soil about us. And how good it made us feel. We had never before in our lives had so much food. Late in the autumn he hauled an old straw stack which was rotting in a field near by, and covered the ground under us.

"This made us feel good, so we went to sleep for the winter, and slept so soundly that we did not wake until the warm winds and sun and rain of March called to us. Then what do you think had been done for us? While we had been sound asleep all the branches, except those which had come from the twigs put into our limbs by our friend, had been cut off. So you see that every leaf that we put out was of the new kind that we thought so beautiful.

"My leaves looked strange to me, but for some time I could not tell what was the matter with them. At last one of my neighbors said to me, 'Your leaves are not all alike!' And sure enough they were not. I could easily tell it myself when I looked closely. There seemed to be five or six kinds.

"Well, we grew faster in the next two years than ever in our lives before. Three years after the farmer's son had begun to work with us you could scarcely have told by the size of our tops that they had ever been cut off.

"That spring, however, we had a new experience. Just as we were beginning to wake from our winter's sleep, and before our buds had begun to open, our friend came pushing a barrel on two wheels with a pipe fastened to the top. He stopped under me first, and held the pipe up among my branches, and threw a very fine mist all over them. It smelled bad and burned a little, but I knew him so well that I was sure that it was in some way for our good. After a little while I heard him tell a man who was passing that he was doing it to kill tiny creatures that were hiding in our bark and would kill our fruit if left alone.

"We were glad to have it put on us after this, for nothing makes us so happy as to be able to bear fine fruit. He 'sprayed' us, as he said, in this way two or three times more during the spring.

"You might think this was too much work to put upon an orchard of old apple trees, but you would not if you had seen the loads of fine fruit we gave him.

"Since then we have been bearing more and more each year, and it is all of the new kinds which were put into our limbs. If you will look me over you will find that there are six kinds of fruit on me. The children come to me for fruit from early in the season until frost, and I never disappoint them."

"I suppose the farmer has not wanted to cut you down lately," I remarked, as the tree paused, thinking, probably, of the children that it had made happy.

"Indeed he has not," was the reply. "Only yesterday he was here getting some twigs for a neighbor to 'bud' into his trees, as he called it, and I heard him say that he would not take fifty dollars for me."

"You say that the neighbor came yesterday to get twigs to put into the limbs of his trees? I thought that the new twigs were put into your limbs in the winter. How is that?"

"I was 'grafted,' " was the reply, "while this man is going to bud his trees. Many people like to bud instead of to graft. Look at that row of little Apple trees over there next to the fence. They were budded a few days ago, and you can find by examining them how budding is done. They belong to a man living near here. He planted the seed and put in the buds which he got from us. Next spring he will cut the tops off and let nothing grow but the bud which he put in, so all the tree will be of the good kind of fruit: our kind, you know.

"In this way people have started good orchards all over this country from the twigs taken from this one. Is it not wonderful how much good came from the farmer's son knowing how to care for us?"

I heard the farm bell ring at this time, calling me to supper, so I bid good-by to the old tree that had been made new, and started down the hill. I had taken only a few steps, however, before a fine apple fell to the ground from a limb of my new friend. I knew as well as if I had been told that it was intended for me, so I picked it up and went down the path eating its luscious flesh and thinking how fine it was that the farmer's son had learned to make so great a change in the old orchard.

XXX

THE STORY OF THE GARDEN PEOPLE

One afternoon in August I stopped at the home of a friend where I expected to spend the night. The father was in a back field cutting hay; the children, who were my special friends, were at school; and the mother was busy canning fruit. Asking her to go on with her work, I promised to entertain myself, and sat on the wide, cool porch, enjoying the song of a cat bird in an apple tree near by until the sun went behind a cloud; then I took a walk about the place.

Everything was in perfect condition. The lawn was like a soft, green carpet; the fine old oak that shaded it had every dead limb removed; and choice shrubs grew around in places which showed that they had been carefully planted and cared for. This surprised me, for the last time that I had been there, five years before, things looked very different. Then, the whole place had been neglected, and my friend had explained that he had no time to look after things about the house. He was too busy with the farm.

Soon I found myself at the gate of the vegetable garden. Here, too, there had been a great change. Everything was in perfect order. Where there had been an old paling fence ready to fall with the first hard wind, there was now a tight wire one, so closely woven that the smallest chick could not creep through, and so high that the most active hen could not hope to fly over. No weeds grew along it, as had been the case in the past, but in their place were fine young grape vines, well trimmed and tied up, giving promise of a great crop of fruit the next season.

The garden was even more beautiful than lawn or flowers. Here, again, there were no weeds, but it seemed to me that no vegetable was missing which a good garden should contain. Potatoes, corn, beans, tomatoes, beets, parsnips, egg plant, celery, onions, cabbage, oyster plant, and many others which I did not know at the time; and each seemed to be racing to see if it could not be ready first for the table.

That I might better enjoy the smell of the fresh earth and growing plants, I sat down at the edge of a path which ran between the fence and the cultivated ground. I was very near a great tomato plant, and what a tomato plant it was! It had been carefully tied to a stake, and the branches had been pruned, so that just as much fruit had been set as could be fully matured.

I sat thinking how I would enjoy one of the great luscious fruits for supper, when a strange sound reached my ears. I thought at first that it was music far away. But no; it was near me, right in the great tomato vine, and in the others around me. I listened carefully, and at last could make out some of the words that the voices were singing. It seemed to be the refrain that I caught, and it ran thus:

"We're Tomato Club Tomatoes, and we're happy every hour,
For the girls who plant and tend us love us, stalk and fruit and flower;
They'll soon be home to gather us, from school not far away,
We love our dear Tomato Girls, hurray for them, hurray!"

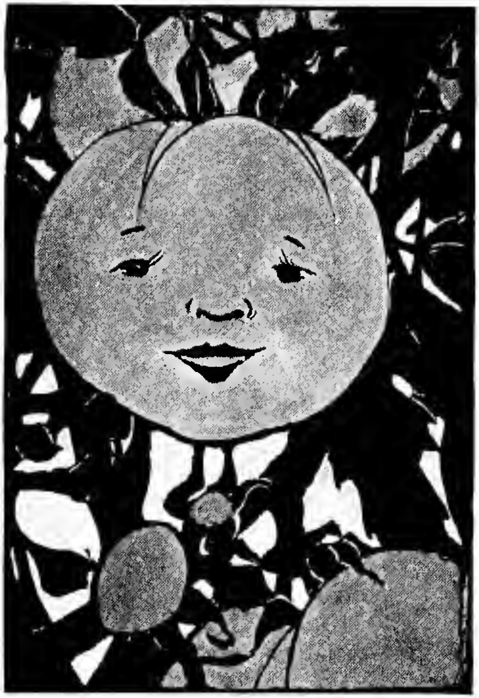
Before I could hear more of the song, it was over, but there was another surprise in store for me. The round side of a tomato near me began to look queer, and soon it was not a tomato, but a little face, with wide, smiling mouth, a flat nose, rosy cheeks, and sparkling eyes.

"You didn't know I could sing, did you?" the little fellow said, before I was enough over my surprise to speak to him. "You see, though, that I can," he continued before I had time to answer him, "and so can all the Tomato boys since the Club Girls began to take care of us. Before that we never felt like it, but the old way of living is gone now, and we are a very happy lot."

"I was listening to your song just now," I remarked, "and I learned from it that you are all happy, but I want to learn more. Will you please sing it to me again?"

"I am tired of singing," he answered, "so if you will allow me, I would much rather tell you what our girls have done for us."

Without waiting for an answer, he went on:



THE TOMATO BECAME A FACE, WITH WIDE, SMILING MOUTH, A FLAT NOSE, ROSY CHEEKS, AND SPARKLING EYES

"A few years ago we Garden people lived a very different life from that which we now live. Then we were planted carelessly in ground that had not been well ploughed, and was full of clods and weed seed, and given very little care afterward. Sometimes the farmer would come among us with his big plough and awkward horse, and plough the ground, but he tore our roots up so that he did us more harm than good. We would often hear him say that the garden cost him more than it returned, and that he had better be working in his corn field.

"Then his wife, and sometimes the children, would come to hoe out the weeds; but the hoes they used were so bad that they would generally become discouraged and quit before they had done much good.

"We Tomatoes, and the other Garden people, too, grew in the best way we could, but that was pretty bad. We fought with the weeds, hunted among the clods for our food, and sprawled over the ground just any way. No one ever thought of trimming one of us, or tying us up. When we Boys began to grow, we lay with our faces on the ground and of course many of us rotted, and none of us could ripen perfectly.

"As we lay in this condition, the children would run through the garden and tramp on us. They seemed to have no thought for us, and of course we did not like them. Then, to finish our troubles, the chickens got into the garden and pecked holes in those of us who were not spoiled in some other way.

"It was a hard life; and when the woman came and complained because we were so poor, we became very angry, for we knew that it was not our fault.

"But three years ago life was changed for us, and since then the good time has come for every one in the garden. It was all because of something that the little girl learned at school. She became interested in us and I heard her say that it was because she had joined a Tomato Club; and that is why we sing the song that you just heard, I do not understand all about it, but she took charge of us, and since then we have had a good time.

"Early in the spring she planted the seeds from which the mother plants came, in a box of fine, rich soil. In this they grew until the garden ground was warm. Then she planted them in a corner which she said was her own, and how different it was from the place it had been before. This fence had not been built then, but she put netting around her part to keep the chickens out. The ground had not been manured and ploughed as she wanted it, so she got an old man to bring many wheelbarrow loads of manure, and then to spade it up and rake the soil until it was as fine as a heap of ashes.

"A man from the school often came around to talk with her about her work, and told her many things to do. She killed every weed, drove in stakes to which she tied the branches, and whenever it became dry she raked the top of the ground so that the water in the soil could not fly away into the air. Often she would bring a bucket of fine manure and dig it in about the roots, and how it did make the plants grow! Raking the ground on top not only kept the water in, but made the surface so soft that when rain came almost every drop of it went down into the earth instead of running off and carrying a load with it.

"And the way we Tomato boys grew was a wonder to the neighborhood. People came from all around to see us. She sold a great many of us, and canned many more. She took the seeds from the finest, and the next year sold them for a good price.

"I notice that you do not understand just what I mean when I call myself a 'Tomato boy.' You see it is this way. Mother Tomato raises us to do a very important work for her. We hold the Seed babies which she makes, and protect and care for them until they go to sleep for the winter. Then our work is done, and if something does not carry us off to be eaten, we die.

"You may wonder how I know all these things which I have been telling you. Well, mother told me when I was very small; and her mother told her when she was a Seed baby, before she went to sleep: or rather the Tomato boy who nursed her told her. Mother does not let me forget to tell all these things to the Seed babies which I care for. In this way plants learn what happened to their people in the past. Seed babies never forget what is told to them just before they drop off into their long sleep.

"The crop which the little girl raised made the farmer ashamed, and the next winter he put this fence around the garden. In the spring, he hauled and spread on it many loads of manure. Then he ploughed it as it had never been ploughed before. He harrowed it, too, until there was scarcely a clod to be seen.

"Instead of leaving its care to his wife and children, as he had been in the habit of doing, and giving them nothing but old worn-out hoes to use, he got new, sharp ones, and then helped them himself almost every morning and evening. It paid him to do this, for only yesterday I heard him tell a man who was here that he makes more from this garden than from any five acres in his fields."

I have no idea how long the little fellow would have continued to talk, had not two childish voices broken in at this point. The children had returned from school, and a tall girl of fourteen, and a boy of ten came running down the path toward me.

They had a great many things to say, and when I looked again at the Tomato boy the face had gone, and it was again an ordinary big, smooth Tomato.

The children told me many things about how they prepared the ground in the spring and cultivated it in the summer, trained and pruned the vines, gathered and canned the fruit.

While we were talking, the mother came with a basket to get some Tomatoes for supper, and soon the "Tomato girl," as I called her, picked the very one which had been talking with me a few minutes before.

"How can you bear to pull those fine Tomatoes?" I asked. "Does it not seem as if you were killing a friend?"

"Oh yes," she answered. "They do seem like friends, and mother says I talk to them all the time when I am out here working, but I am sure they are pleased whenever I gather them to eat or to can.

You see they are done growing, and if they were not pulled they would rot, and I am sure they would not want to happen to them. Sometimes when I come into the garden I think they are calling to me, 'Come and gather us. We have done our work and are tired of play, so we want to be eaten. Take us all, for we love you for what you have done for us.' I call them my 'Tomato boys,' for they are sons of the big mother Tomato vine."

I laughed at this, and we went into the house together. She did not know why I laughed, but you can guess that it was because what she said was so nearly the same that the Tomato boy had said to me. If they did not talk with her, she at least understood them very well.

After supper, while my Tomato girl was helping her mother with the evening work, her father told me how the Canning Club had caused every one to take an interest, not only in Tomatoes, but in gardens, lawns, flowers, and fruits. Later on we went into the cellar where rows of beautiful canned Tomatoes and preserves showed that the girl, as well as her garden pets, had been very busy.

Besides this, after the lamp was lighted, she showed me the little book in which the banker had set down the sums of money she had left with him, all earned from the Tomatoes she had canned and sold at the village store. Before she went to her room to study I also learned how she was planning to have her Tomato boys help her father to send her through college when she was ready for it.

A little later, as I fell asleep, the song of the Tomatoes mingled with that of a mocking bird singing in a rose bush over my window, and soon in my dreams I saw two round-faced Tomato boys walking beside their Lady as she climbed the steps of a great college building.

EXPLANATORY NOTES TO THE STORIES OF THE WATERBOYS AND THEIR COUSINS

INTRODUCTION

WHY should we relate to children the Norse and Indian legends and Greek myths, imaginative and interesting though they be, yet not touching closely any of the problems of child-life—and stop there? Why do we not intermix with these, stories of Nature and Science which are so filled with vital truths profoundly affecting the life of every child? A principal obstacle may be the lack of material; and so, if these stories in the hands of teachers awaken as much interest as they have through recital by the author, it is hoped that they may prove a useful contribution to The Fairy Stories of Science.

In order to extract the highest value from a story which is read for the purpose of reproduction, let the class read it through carefully one day, but do not discuss it. Let it be understood, however, that the pupils are to reproduce it orally at the next lesson. To increase the interest there are suggested experiments and observations for many of the stories which will deepen the impression of the truths taught therein. At the second lesson let the pupils tell the story, and the teacher supply any needed information; while for the third lesson there should be a written reproduction of the story, with an oral report of such experiments and observations as were possible. In such cases, these written reproductions should be illustrated according to the pupil's ideas, following, in some cases, suggestions made by the teacher.

Read the story until you seem to tell it rather than to read it, or better still, really tell it, either in the words in which it is written, or in your own words. But whatever you do, put *your own life into it*, or it will in a large measure fail.

As should be the case with all things that you read, so interest the children that there will be a demand for the book to "take home"; for the home is that for which you are working. It is only so far as you are able to reach the home through the child that your work is permanently effective. Remember this, and see if you cannot make the "Waterboys," the "Nitrogen Bacteria," the "Baby Plants," and the other living things of these stories displace some of the topics of neighborhood gossip as subjects of conversation.

The notes which follow are intended to assist the teacher in selecting the chief points to be emphasized and illustrated; to suggest experiments and observations; and in some instances to offer additional facts which the teacher should know and may wish to give to the pupils.

FROM DEWDROP TO RAINDROP

In this opening story the child is introduced to the molecule, —the most important physical fact in nature,—in the form of the Waterboy. Why not give the molecule life and human form if by so doing one can make it more real? Molecules are so small that no power can enable us to see them, their size averaging something like one-hundred millionth of an inch in diameter; but we know that not alone water, but that everything in nature is made up of them. We know, too, that they are always dancing. slowly when cold, faster as they become warm; and that as they move more rapidly back and forth they push a little farther apart, so that the mass of them occupies more space. Also, that as they become slightly separated, they lose their hold of one another, so that each can more easily let go and fly off into the air, just as the Waterboys did when the sunbeam touched and warmed them. Or, if it is the molecules of a solid substance like iron, they first let go of one another just enough to permit the mass to bend. Those who have made a life study of molecules tell us, however, that they are not solid bits of matter, but wonderfully complex structures; so why not let us give them life and arms and legs and heads that we may the better think of their wonderful ways? This conception, introduced into this first story, is carried further in the following stories, and is made of general application in the story of "The Dancing People."

Encourage the child to think in terms of these tiny invisible friends as he observes the sunshine or warmth drying things about him; when his breath, blown against a cold window-pane, forms a film of water, or "smokes" when blown into the cold air; when the dew forms on the grass; when the fog forms in the valley; or when the drops of moisture form on the cup of cold water. In all these examples the Waterboy is either stimulated by warmth to fly off into the air, or driven by cold to gather with his fellows until masses are formed which our eyes can see. If this method is followed, clouds, dew, fog, rain, each will take on new meanings to the child, and meanings quite correct, although embodied in the person of a Waterboy instead of in the dead molecule of the scientist. Let parents talk to their children in terms of these new friends, and let teachers make the contained idea the basis for many observations and language lessons, both oral and written.

THE WATERBOYS WHO RUN DOWN THE HILL

In our country millions of dollars are lost annually by the destructive work of run-off water; but our wealth is built upon that part of the rainfall which enters the soil in order to come out again from the ground in the form of springs and seapage along water courses; or later to rise as capillar water—like the oil in a lamp wick—to supply needy plants during drouth, and to bring to them from deep within the earth a supply of mineral food. This story, and the two which follow, present to the child these most important facts. Just as truly as if they were intelligent beings, the drops of water that fall upon the ground and find no openings through which to enter, will seize and carry with them to the lower valleys, or possibly even to the ocean, the choicest bits of soil, thus robbing the farmer and the community of that which nature had been preparing for their good for ages past. The work which is done by run-off water should be fully discussed; experiments made and observations carried on. The following suggests what may be done in this line:

I. Experiments.
   1. After a hard rain secure a gallon of water from a roadside ditch which is running full of water. Allow it to stand until it becomes clear. Which material settles to the bottom first? Which last? How long does it take the water to become clear?
   2. Fill two pots, cans, or boxes with soil; one with very poor, hard, clay, the other with a rich garden soil full of humus. Upon each of these pour the same amount of water, at the same rate, and note the rapidity with which it is absorbed. Which encourages run-off? Which absorption?

II. Questions to be answered by experience and observation.
   1. Which washes the more seriously, gently sloping or steep land?
   2. Does a field wash more during slow or dashing rain?
   3. Does a grass covered or bare field wash more seriously?
   4. Are streams coming from forests usually muddy or clear?
   5. Does clearing the timber from land affect the springs or streams?

These experiments and questions will serve to indicate the line of development which will be found possible and profitable to follow this story. Especially stress local conditions and stream features. Fields, illustrating all the conditions asked about in these questions will frequently be found within sight of the school house. Make good use of such examples.

THE WATERBOYS IN THE GROUND

One of three things will happen to the water that enters the soil: The humus will absorb it like a sponge; or it will form a layer of *film water* around the soil grains; or, if it cannot do either of these things, gravitation will gradually pull it downward until it finds a level below which all spaces are filled, where it will stop and stand as *ground water.* The water in the humus, and the film water, will finally pass upward like the oil in a lamp wick, as the heat evaporates the film water from near the surface; and the ground water will rise to take its place, or else it will move off through the earth to a lower level where it will escape as springs, or as seaps into streams.

In telling the story of this soil water in terms of the Waterboys, the dissolving of mineral matter from the soil is expressed as the Waterboy "eating from the soil grains." This work of the water while in the earth is of great importance, as it is the means by which the greatest supply of mineral plant food is obtained, the cause of the saltness of the ocean, and the chief active agent in soil formation. Spring water tastes very different from rain water because of the mineral matter taken by the water from the rock through which it passes. This mineral matter, of whatever kind it may be, is carried by the water until it evaporates into the air, when it must leave all solids behind it. For this reason the ocean is gradually becoming more salt, since salt is the material carried most abundantly in solution. Every substance known in the earth's crust, however, is found in the ocean water, because the Waterboys "eat" a little of everything with which they come in contact while moving through the rock.

In connection with the reading of this story, the child should be encouraged to observe springs and places where hillsides and stream banks are constantly wet by seaping water. He should note the difference in the taste of rain water and of that coming from the earth. A well should be thought of as a hole extending down into and below the level of ground water.

The importance of keeping growing crops on the soil during the winter in order to increase the absorption of water, which finds its way down beside the roots; and of checking run-off, with its soil destruction, should be especially emphasized.

HOW THE WATERBOYS CLIMB BACK TO THE AIR

In the same way the oil from a lamp rises in the wick, so, when the surface of the soil becomes dry after a rain, does the water begin to climb up from the ground water level to take the place of that which has been evaporated.

The chief points to be considered in the story are, first, the things which hinder the Waterboy in reaching the surface, such as closely packed soil or "hard pan" just below plough depth; clods, and a surface broken by cultivation so as to allow the water to come close to the top, but not near enough to evaporate rapidly; and second, the aid which roots offer the water to escape from the soil. The hard pan and clods are of course a disadvantage to plants because they cut off the water supply from below, while the broken surface layer is a benefit because it permits the water to rise to the level of the roots, but does not permit it to escape.

In connection with the story, the following experiments will prove interesting: Place a board or stone on dry ploughed ground and after a few hours note the moisture in the soil. This is water which has climbed up from below, but which has been unable to fly off into the air. Tie cheese cloth over the large end of a lamp chimney, fill it with soil, and stand in a shallow pan of water. The Waterboys soon will be seen climbing through the soil wherever it is not too coarse. Different types of soil may be tried to observe differences in the rate water climbs where soils are coarser or finer, and through space filled with clods.

HOW THE ROOT CHILDREN GET WATER TO DRINK

The points of chief interest in this story are: It is only the tiny rootlets and root hairs that take up water and plant food from the soil; larger roots carry water to the stem and hold fast to the soil; water standing between the soil grains is of slight value to plants because it contains so little mineral food; water which has been long in the ground and forms the film over soil grains is of the most use, because it contains food; clods lock up plant food and prevent water storage in the soil; deep cultivation injures the roots, while shallow cultivating keeps the water from passing off into the air; soil should be thoroughly pulverized before seeds are put into it, so that roots may spread easily through it.

Root hairs for class observation may be developed easily by germinating seeds between layers of wet blotting paper, or in jelly glasses half filled with wet sawdust or moss. Corn may be grown in a pot or box of soft soil until the stalk is 6 inches high and then all the soil washed from it. The large amount of roots, and their length will be a surprise. It is a fact that the roots will stretch across the row before the plant is knee high.

THE WATERBOYS IN THE CORN STALK

The passage of water, carrying mineral food from the soil into the roots is not through actual openings, such as can be seen by any human power, but by the process of osmosis, or the movement of liquids and the materials dissolved in them, through the spaces between the molecules that make up a thin membrane. It is by this process that all substances in our bodies pass from alimentary canal to blood, from blood to lymph, and from lymph to cell; and the same general process takes place in other animals and in plants. It is true that much of the mineral matter thus carried by the water is distributed to the various cells along the stem, and also in the leaf, to be used by them in the process of manufacturing the various tissues of plants; and true also that great crowds of other bodies like the Waterboys crowd into the "doors of the leaf," for during daylight the molecules of carbon dioxide gas are continually coming into the leaf to be used in starch manufacture. This will be described in a later story. The power of leaves to give off water may easily be demonstrated by placing stems with leaves on them in bottles of water, with cotton lightly packed around them to prevent evaporation.

STRANGE WAYS OF THE WATERBOYS

In this story the Waterboy idea is further explained, illustrated, and slightly generalized by the introduction of the Air People. The explanation of the snow and frost crystals, while not a scientific one, of course, involves the fact that the whiteness is due to the air which is inclosed with the Waterboy mass. It involves no essentially wrong thinking. The explanation of why ice expands when it freezes is purely imaginative, though it is probably true that the expansion, which is not well understood by any one, is due to some change in the water molecule. So why not the explanation given, as well as any other? There are a few other substances which present this strange characteristic of expanding when changing from a liquid to a solid. The explanation as to why water climbs up the side of a glass, or clings to the finger, or rises through a piece of blotting paper or the soil, is only another way of expressing what the physicist means by the words adhesion and cohesion. The former refers to molecules clinging to molecules of other kinds; while the latter indicates their power to cling to those of their own kind. The floating of the needle depends upon the same principle, there being no adhesion in this case between the water molecules and those of the air, with the result that the surface cohesion of the water molecules becomes greater than that below the surface. The relation of heat to the drying of a dish; or of water on wet clothing, depends upon the relation of heat to the rate of dancing of molecules, and their consequent greater distance apart, and naturally slighter hold on each other.

In connection with this story teachers should perform experiments, such as the floating of a needle; the piling up of water in a glass caused by dropping small nails or gravels into a glass already filled to the brim; the rise of water through blotting paper, of oil through lamp wick, etc. In addition, the pupils should be encouraged to look for examples of these peculiarities of Waterboys in every-day life.

THE DANCING PEOPLE

This story is the last in which the Waterboys play a leading part, and should be very carefully read, and re-enforced by discussion, examples, and experiment. Its aim is to generalize from the conception of the molecule, as impersonated by the Waterboy, to the conception of the molecule as one of the great family of the Dancing People.

While the experiment with the cup may be made, it is better to use a bottle. This may be warmed by the hands, or by a match, to drive out the air. Leave the mouth under water until the air cools, and note how the water is drawn into the bottle to take the place of the air that has been driven out by heat. Review the things learned in former stories, making sure that the child has clearly the conception that molecules are constantly dancing; that their rate of movement increases with heat; that as they dance faster they occupy more space, pushing each other a little farther away; that as they get farther apart they hold less firmly to each other; and that some, such as the water molecules, loosen their hold upon each other entirely and fly off among the air molecules.

In addition to these characteristics of molecules, and the fact that everything is made of them, this story introduces the idea that molecules themselves are made of other more minute particles, here spoken of as the "Clinging People." There are, of course, the atoms of the scientist,—those final elements in the analysis of substances with which the chemist deals. This mere allusion here is all that is done in this series of stories to suggest chemical changes and attractions, except that in the stories of the Greenleaf Men and the Plant Workers the same idea is suggested in the formation of starch, and the conversion of starch into sugar, and sugar back into starch again. The teacher, in connection with this story should at least emphasize the fact that there is, as the Waterboy suggests, a great field of the most interesting and profitable knowledge in the study of the make-up of molecules and the ways of the "Clinging People" that compose them.

HOW THE PLANT PEOPLE WERE SAVED FROM STARVING

This story, and the two which follow it, embody facts which are of the utmost importance to farmers, and make an easy approach to the subject of soil fertility. Phosphorus, potassium, iron and sulphur are mentioned as foods contained in the rocks, while nitrogen must be obtained directly or indirectly from the air. There are 35,000 tons of it above every acre of the earth's surface, so the supply is virtually inexhaustable. All that is necessary is to allow the nitrogen-fixing bacteria which grow upon the roots of the clover family, to take it from the air for us. The setting of the story is purely fictitious, of course, but it is probably a fact that these bacteria lived for long ages free in the soil before forming the habit of living upon the roots of certain plants,—members of the Legume family,—of which the clover is the most common representative. The work of these bacteria is quite a complex process, and many details of it are yet obscure, but it is sufficient for the average person to know that in their life processes these bacteria take nitrogen from the air and combine it with oxygen, forming a compound known as nitrous oxide, NO_2; just as animal bodies take food with carbon in it and combine the carbon with oxygen to form carbon dioxide. The

NO_2 and CO_2, upon coming into contact with water, unite with it and form in the one case nitric acid, and in the other carbonic acid. The nitric acid formed in the water of the nodule or of the soil is in a form to be used by plants as food; and if there is lime, potassium or sodium in the soil it will unite with one of these to form calcium, potassium, or sodium nitrate.

MORE ABOUT MR. CLOVER AND HIS PEOPLE

In the story told by Mr. Clover we learn more about the nitrogen-fixing bacteria. A point of great importance is that there are different kinds of these tiny organisms growing upon different plants, and that where the bacteria for a certain plant does not exist in the soil, seed or soil must be inoculated with its special kind before that plant will take nitrogen from the air. Teachers should secure bulletins from Experiment Stations and the United States Department of Agriculture describing methods of inoculation.

Another important point is that these bacteria do not thrive in sour soil; and that lime is the remedy for acidity.

The child should be encouraged to bring in specimens of legume roots with nodules on them; and to test acid soil with litmus paper. The litmus test may be made very easily by securing a little litmus paper from a drug store and enclosing a bit in a ball of wet soil for a few hours. Cow peas, soy beans, clovers, vetch, and other legumes should be grown in pots or school gardens, and the nodules on each carefully noted. Some pots may be filled with soil which has been baked to kill the bacteria, and then watered with boiled water to prevent the formation of nodules. If this is done successfully the result will be a slim, yellow plant,—the direct way which the plant has of expressing nitrogen hunger. Teachers should have pupils watch the fields for plants which show this nitrogen hunger by their yellowness and scanty leaves.

TOMMY'S LITTLE FRIENDS

Living organisms in the soil have a very important relation to agriculture, and they serve men in two ways: In the first place there are countless numbers of the nitrogen-fixing bacteria which take nitrogen from the air, living in the soil independent of the roots of legumes. These bacteria are more abundant where there is a good supply of organic matter in the soil, and dislike an acid soil as much as their relatives who live on legume roots. More important than these are the bacteria which live upon and decay the organic matter in the soil. Were it not for them the food matter in plant and animal bodies, and animal wastes, would be permanently locked up. It is impossible for plants to use manure or the food that is in other plant tissue, until it has first been taken as food by these bacteria, broken up into simple compounds, and thrown from their bodies into the soil as waste matter. Tommy's little friends are very real, and it should be a source of interest and inspiration to boys and girls to know that the soil with which they work is really such a wonderful work shop for these tiny members of the plant world.

THE STORY OF THE GREENLEAF MEN; AND THE LITTLE PLANT WORKERS

These stories attempt to go more deeply into the mysteries of plant life than any other story of the collection, unless it be those of flower and seed production. It involves the great "Miracle in nature," as John Fiske styled it, the making of the organic out of the inorganic.

Any net-veined leaf will show how wonderfully the leaf is supported by a framework of veins. These do not only support the thin mass of cells composing the blade of the leaf, but constitute a system of tubes through which water and mineral food are carried up from the soil; and manufactured food carried down for use and storage in the lower parts of the plant. The illustration in the text shows this veination, and also what only a microscope will reveal, the tiny "mouths" or breathing pores, through which water vapor and other gases pass in and out of the leaf. Most wonderful of all, however, are the cell-work rooms, where the Greenleaf Men live, with their mills. As is quite generally known, all living things are made of cells and all cells are more or less wholly made of protoplasm, a material which is quite like the white of an egg. Within the protoplasm are many tiny grains of a denser substance, the largest of which is called the nucleus, while the smaller ones are known as plastids.

The Greenleaf Men are those peculiar plastids of leaf and stem which when in light develop green coloring matter, or chlorophyll. The chlorophyll is the "machine," for without it Greenleaf Men are powerless to do their work. The sunlight is the power which runs the machine; water and carbon dioxide are the raw materials which are used in the mill; starch is the material manufactured; and oxygen is the waste material thrown away because it is not needed in the process. This process can only work during daylight, so when night comes the plants cease giving off oxygen. In fact, they give off carbon dioxide during darkness just as animals do. Plants, for this reason, are helpful in a living room, because they use carbon dioxide and give off oxygen during the day; but they are not beneficial in bedrooms, because at night they reverse this process, producing carbon dioxide and consuming oxygen.

The story as continued in the Little Plant Workers deals with the changing of starch into sugar; and the combination of sugar with other materials to make the various parts of the plant. This work goes on in the leaves almost wholly at night, but in other parts of the plant it is carried on continuously. The "Workers" in this case are granules of protoplasm, not provided with green coloring matter. The exact nature of the process is very difficult to explain, so that it is about as well to stop with the idea that the living protoplasm is responsible for the changes brought about in the plant, directly, or by means of a substance formed by it known as a *ferment* or *enzyme*. Starch is changed into sugar in our bodies in the same way that it is in the plant; but in human beings the work is done by a substance produced in the salivary glands or the pancreas. In each case the method is the same, a water molecule and a molecule of starch or two molecules of starch in plants forming cane sugar, are caused to unite by the saliva, or by the protoplasm of the plant cell. This power of the saliva can be shown before a class by boiling a small amount of starch in half a glass of water, placing a few spoonsful in a test tube or bottle, mixing saliva with it, and allowing it to stand in a warm place for half an hour. A few drops of iodine dropped into it, after standing, will show that there is no starch there; and the Fehling's test for sugar will show sugar to be present.

Oil is made by taking a part or all of the oxygen out of the starch molecule. Animals as well as plants can do this. We eat sugars and starches and our cells change them to fat when there is more than we need at the time. It is a correct statement that the Workers—protoplasm—make all other parts of the plant by combining starch with minerals brought from the soil. As is stated in the story, those Workers which make the food we class as protein are the most wonderful, for they make molecules containing so many different substances, and so complex in structure, that they almost defy analysis.

Wherever starch is deposited in darkness, as it is in roots and under ground stems, in seeds, and in inner bark, it is made from the sugar in the sap just as described. The protoplasm removes the molecule of water that had been combined with the starch molecule by the Workers in the cell-rooms of the leaves, and it again becomes starch.

PLANT STORE-HOUSES

There is little which needs to be explained about this story. Its chief purpose is to draw attention to the adaptations found in plants. The potato is really a stem, as is shown by the "eyes," which are merely buds, and the fact that it has no roots growing from it, as is the case with the sweet potato. It is like the fleshy roots of lilies, flags, and many other plants, except that it has become much more rounded than they. It is a means of carrying the life of the plant over the winter season; and of providing food for its start in the spring. The same thing is true of beets, carrots, and other plants of this type, with the difference that in these cases the stem is very short, just enough to bear the leaves, and food storage goes on in the root. Bark and stems are also important places for storage of food, as are leaves in such plants as onions and cabbage, which are merely leaves attached to shortened stems and filled with reserve food. Seeds, however, are the greatest store-houses, and for this reason they are the greatest sources of human food. Food in them is much more concentrated than in the other cases mentioned. But the point should never be lost sight of that this food storage is primarily for the benefit of the plant; and that animals and men make use of supplies intended only for the next generation, or the future growth of plants, thus showing in this process of storage the universal tendency of all living things to live for the good of the coming generations.

THE GREENLEAF MEN AND JACK FROST

The green coloring matter in the leaves, or chlorophyll, is spoken of in former stories as the "machine" with which the Greenleaf Men do their work. This story is quite true because it is the disintegration of the chlorophyll and other organic compounds in the leaf which causes the autumn colors. Frost and the decrease of water supply seem to be the contributing causes which bring about this change. Much of the organic material of the leaf passes into the stem, but the leaf is left with a large amount of useless mineral matter in it which aids in the coloration. Leaves, leaf scars, and young stems should be collected and studied in school in connection with this story. The building of the cork layer is a fact, and it is responsible for the fall of the leaf as is stated in the story. Leaves that remain on the tree during the winter, such as pine needles, holly leaves, etc., have very thick coverings which protect the "Greenleaf Men" so that they can live through the coldest weather.

PLANT BABIES, AND HOW BABY PLANTS GET OUT OF THE GROUND

There is no expression more correct than to call a seed a "baby plant." A baby is an adult in embryo, with the same parts in different proportions and on a smaller scale. And this exactly describes a seed. An examination will show to any one, especially if aided by a strong hand lens, that tucked away between the halves of the bean are two leaves, a minute stem, and a tip which when it begins to grow, will show that it is a root by turning down. A sufficiently careful examination would show a terminal bud between the leaves at the end of the stem. In other words, the seed contains a complete bean vine, living and ready to grow when given suitable conditions. To many it is a great discovery that the food in the bean is put there for the good of the baby plant, and not for man's benefit. The "seed leaves," or cotyledons, are full of starch and protein for the very reason given in the story. The "tiny hole" through which the Water-boys enter to wake the baby is the micropyle, an opening left during the formation of the seed. It may easily be found by pinching a bean soaked in water and observing the water come from it. It is a very simple experiment to "steal food from Baby Bean." Plant a number of beans in a pot, can, or small box, and just as they are coming from the ground carefully cut one cotyledon from one, and both from another. It will be interesting to note how quickly those with the food which nature had provided for them will outgrow the others; and how much more rapidly the plant with half its food will grow, than the one that has none.

Following the reading of this story, many different seeds should be planted in window boxes or pots, and their germination and growth carefully watched. Teachers will find these experiments most valuable as a source of material for language work. The child will be deeply interested, and if nature is followed she will demand an orderly arrangement. Peas and pumpkins should certainly be used, the latter to show the peculiar manner in which the baby becomes free from its coat. Germinate seeds in jelly glasses, as suggested in the notes on the story of "How the Root Children Get Water to Drink." Pumpkins are also well suited to show that the cotyledons are really leaves, as theirs become green and grow. Corn, wheat and other seeds of this kind should be planted to show the difference in their manner of coming from the ground, which is due to the fact that they have only one seed leaf, and that but one leaf develops at a time. Instead of being dragged from the soil, these single leaves are rolled into a peg-like point and pushed upward.

WHY BEANS CLIMB

The chief object of this story is to introduce to the child the idea that plants are as they are to-day because of long periods of gradual change, during which they have fitted themselves to peculiar conditions of life. Without doubt there was a time in the history of the world when there were no climbing plants, just as there was a time, long ago, when there were no plants which had stems to lift their leaves to the light. Just as some plants developed stems as a means of obtaining more light, so other plants which grew in crowded places found it necessary to develop some other means of getting to the light, or else die. It is my purpose here to give at least a hint of this very important process in nature; the change of form or structure in plants to fit them to new conditions of life. The child should be encouraged to observe the various means by which plants climb; *e.g.*, by twining, like the bean; by hold-fast branches, like the Virginia creeper or Boston ivy; by tendrils, like the grapevine; by thorns, like the rose; and by any other ways which may be discovered.

PLANT BABIES THAT FLOAT AND SAIL

This story and the two which follow are especially appealing to children because of the Babies of each of these types which may be seen in any country place when once they are made known. Emphasize the parental care that is shown in these flying cradles and the other means of scattering seeds. This is not parental care in the sense in which the word is used in regard to the higher animals, but none the less a care which results in great advantage to the plant. A very interesting collection may be made of each type of seed. The floaters, the sailers, and those that steal rides may be mounted upon cards, or bound under glass by means of *passe partout,* making tasteful wall decorations. The fruits may be collected and dried or better preserved in small wide-mouthed bottles. A collection of all native wild fruits will be of value to any school. These seeds also afford fine material for drawing lessons. Additional subject for study in connection with the stories are the animals which aid, willingly or unwillingly, in distributing seeds. Birds, especially, do much of this work. Do not fail to impress upon the child who reads the stories the wonderful perfection of all the processes in nature.

PLANTS THAT NEVER WERE BABIES

Most children have some knowledge of "Plants that never were babies," though they have probably paid little attention to them. Geraniums, roses and other flowers which may be started from slips; shrubs taken as sprouts from a parent bush; strawberry plants; raspberries that have cane tips rooted to the soil; potatoes cut into pieces and planted, are all examples quite generally familiar. After reading the story the child should be urged to start many varieties of slips, either in water or in wet sand. A bottle hanging in a window makes a home for a branch of Wandering Jew where it will live and grow in water for months. A fuller knowledge of the starting of plants from slips and cuttings should result in a great increase in the number of grapes, roses, gooseberries, etc., in any community, and a decrease in the money spent for such plants; for when the art of propagation from slips is well understood, plants can be rapidly multiplied without expense.

TWIG BABIES

This story is told for the purpose of bringing out the fact that a bud is an embryo branch just as a seed is an embryo plant. A twig bud has within it the start for every leaf which will form during the season that it develops. Some of these "baby leaves" are very minute; while others, such as those of the tulip tree, or "yellow poplar," as it is frequently called, are quite large and perfectly formed. Of course the stem, also, is in the bud, but so shortened that there is barely room to attach the leaves. Both it and the leaves are formed during the growing season and by the time the leaf falls they are completely wrapped away for the winter in an inner layer of soft downy blankets, and an outer layer of waterproof coats. Hickory buds are fine to show this wrapping, though they are not especially good to show the leaves within. That some buds make flowers instead of branches will not seem out of order when we come to know that a flower is a modified branch, and that the parts of the flower are modified leaves. Buds of different kinds should be collected and observed in connection with the story, and their protection by leaf stems, or in some cases by thorns, should be noted. Thorn protection is shown especially well in the black locust and the wild smilax, or green brier. What has been said does not apply to buds of indeterminate growth, such as those of the blackberry or raspberry, for these plants continue to grow as long as the season is favorable. Most trees, however, develop all the leaves and length of stem very soon after growth begins in the spring, and during the latter part of the season enlarge and strengthen those that have been formed early in the season.

THE FLOWER STORIES

The stories told under this title, and the story of Tassels and Silks, are intended to teach, not so much the names of the different parts of flowers, as to explain the wonderful uses of these parts. Every child should learn at home or at school the principal parts of a complete flower, sepals, petals, stamens and pistils, but some skill will be required to make clear to him the uses of these parts.

There are only two essential parts, the stamens, which produce the wonderful pollen grains, and the pistils which form within their deepest parts the tiny egg cell which is to become the baby plant, when awakened and caused to grow by the touch of the pollen cell. Sepals and petals are for the uses spoken of in the story. Do not fail to emphasize the wonderful fact that two especially formed, living cells, each with its own life characteristics, must unite before a new life can be produced. And this is true of every living creature, plant and animal, except very low forms; and those plants ''That never were babies.'' Make this generalization here, for it will be of great value to older pupils in the grades, because it forms the natural starting point for right instruction in regard to the mysteries of sex. The assignment of sex to sepals and petals is purely for the benefit of the story, but not so in case of the stamen *''boys''* and pistil *''mothers.''* Here there is sex, actually; and it belongs in the class with the formation of starch as one of the great ''miracles of nature.''

In connection with these stories every child in school should be directed in the study, collection and mounting of many forms of flowers. Be on the watch for complete flowers, those having all four parts; perfect flowers, those having the essential parts, stamens and pistils; and the uni-sexual flowers, having only stamens or pistils. Then, too, there are uni-sexual flowers born on the same plant, like the corn, oak, chestnut, etc., and those born on different plants, as is the case with persimmons, some kinds of strawberries, etc. Very attractive mounts may be made on card-board, and much finer ones under glass, bound by *passe partout,* as suggested for the mounting of flying seeds. Be sure to make the collection and appreciation of flowers a strong point, while not neglecting the wonderful functions of the flower as a whole and of each of its parts.

MOTHER CORN STALK'S STORY

The troubles of Mother Corn Stalk are very real, as may be shown by travelling over the large areas of our country which do not produce enough corn per acre to cover expenses. Worse even than this actual loss to the producer is the relative loss in the great corn sections which are producing many bushels per acre below the standard of its greatest production soon after being brought under cultivation. This story is written with the purpose of making this condition real to the child who reads it.

Some of the reasons for the decrease are as follows: Continuous cropping, with the attendant reduction of fertility; carelessness, or more frequently entire neglect of seed selection; poorly ploughed ground; clods; bad or insufficient cultivation; weeds, a list sufficient to make the most patient Corn Mother lose hope. The final appeal for help, not only for the corn babies, but for the farmer himself who is to be taught, not blamed, is an appeal to the teacher, and this should lead to a study of corn in the school; to the celebrating of Corn Day, when a program is given wholly about corn in a school house which is decorated in honor of the chief guests, many fine corn stalks brought in from the neighboring fields. Books, bulletins from the Agricultural Department, Washington, and from State Experiment Stations, will make easy the carrying out of such a program.

THE SEED EAR'S STORY

Here is the other side of the picture which was drawn in the last story. In addition to the characteristics of a good ear of corn, which are quite fully stated, the treatment which corn should receive is set forth. Careful selection of seed and breeding to type; well prepared seed bed; shallow cultivation; freedom from weeds; rotation of crops, including a legume; in these we have the opposites of the conditions so sadly complained of by Mother Corn Stalk.

This story, of course, should have a prominent place in the thoughts of the child as he studies corn, in school and in the field, and when preparing the Corn Day program mentioned above. Every child who can gain access to a corn field should be encouraged to search for ears conforming to the type described as the perfect seed ear. This type is quite clearly shown in the accompanying photographic illustration.

THE OLD APPLE-TREE'S STORY

This story is intended to awaken interest in plant propagation, orchards and the care of fruit trees. Its reading should be accompanied by a discussion of home orchards, and the things that should be done to make them better. At the same time instruction should be given in grafting and budding. Injurious insects and diseases common to the neighborhood should be studied, and the proper spraying methods learned for each case. The methods of preparing the ground, cultivation, and other treatment as described in the story are quite correct and only need to be supplemented by instruction that can be obtained from Government Bulletins and books on fruit growing, as well as from fruit growers in the neighborhood. An increased interest in and knowledge of orcharding on the part of school children should result in more and better fruit for the home, and an increasing supply for the market. Orchard Day programs may be arranged, similar in general nature to the Corn Day programs, and with equally good effect. Follow up the interest aroused by the story with study of books, orchards, bulletins, and nursery catalogs; with especial attention paid to the community spirit developed through the exchanges of choice varieties by means of scions for grafting, cuttings, roots, etc.

THE STORY OF THE GARDEN PEOPLE

This story is intended to do for the garden what the preceding one did for the orchard,—awaken such an interest in gardening that further study of the subject will be taken up willingly, and better gardening methods finally result. Many farmers neglect the garden, and in so doing greatly decrease the attractiveness of farm life; while many more fail to have the quality and variety of garden vegetables that they should have. Here again the story should be followed by the reading of bulletins, and discussion of home garden conditions; as well as general principles for garden improvement. Not only will the home table be benefitted by this, and interest aroused at school; but in many cases a connection will be made with canning club agents, and production for market will follow. Garden Day may well be celebrated in connection with the study of this story along the same general lines as the special programs suggested in connection with the last two stories.